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# Managing business using emerging technologies: an examination of firms' performance through big data and enterprise applications capabilities

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# Managing business using emerging technologies: an examination of firms' performance through big data and enterprise applications capabilities

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**Abstract:** It is imperative for the organisations to bring operational efficiency like in supply chain operations. However, still there is a gap to understand the insights of big data analytics (BDA) and enterprise application integration (EAI) to ensure the connection with organisational performance such as supply chain performance (SCP) within SMEs of China based on a resource-based view. First, this study endeavours to find the connections between corporate CSP and BDA. Second, the study explores the moderating relationship of EAI between BDA and corporate SCP, respectively using the method of structural equation modelling. It was found that BDA has a positive connection with corporate SCP. Similarly, the research identified an advantageous EAI nexus between BDA and corporate SCP. This study provides insights into supply chain management with knowledge about how incorporating emerging technologies, such as BDA and EAI could improve business SCP. Furthermore, this study offers a number of intriguing implications as well as additional work opportunities for researchers to support the idea of the current debate from various themes, globally.

**Keywords:** enterprise application integration; EAI; big data analytics; BDA; supply chain performance; SCP; structural equation modelling; resource-based view; RBV.

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**Biographical notes:** Chunjuan Deng is serving in Vocational College of Finance and Economics, Yangchuan, China. Her area of expertise includes big data, supply chain, and green operations. She has several years of teaching and research experience in the domain of big data and enterprise information system. She is very enthusiastic to conduct more research in the domain of her interest in future.

## 1 Introduction

The research particularly on corporate supply chain performance (SCP) is receiving a lot of attention from academics, practitioners, and researchers around the world (Arzu Akyuz and Erman Erkan, 2010; Houlihan, 1985). Such researchers worked determinedly to investigate the variables that affect enterprise supply chains across various domains. SCP is defined as the businesses' capacity to effectively manage issues pertaining to the supply chain, including both the inbound and outbound supply chains (Lummus and Vokurka, 1999; Maestrini et al., 2017). These stakeholders could be buyers, distributors, or suppliers (Savage et al., 1991; Waheed and Zhang, 2020). Big data analytics (BDA) and enterprise application integration (EAI) may be useful practices to implement in operations to enhance the operation of supply chains. The researchers found that BDA is crucial for business success because many businesses are incorporating it for getting success (Elgendy and Elragal, 2014; Russom, 2011). Numerous authors have previously worked on BDA to highlight its significance in terms of various viewpoints, themes, and domains (Elgendy and Elragal, 2014; Russom, 2011; Singh and Reddy, 2015). A study revealed the relationship between BDA and high values of firms (Popovič et al., 2018). Another study examined the function of BDA from the perspective of health (Khanra et al., 2020).

EAI is defined as the way through which organisations use distinct software and remainder computer-based programs to improve the operational efficiency of the organisations (Gorkhali and Xu, 2016; Irani et al., 2003). In the past, experts attempted to assure the impact of EAI in different themes of the world other than corporate SCP (Erasala et al., 2003; Irani et al., 2003; Puschmann and Alt, 2001). It has a wide range of usage for different organisational operations. Scholars have also looked at EAI practices to investigate its nexus regarding different dimensions and perspectives. A study tested the relationships between EAI capabilities and the electronic commerce perspective (Erasala et al., 2003). A study revealed a link between EAI and business performance (Freire et al., 2019). Another study evaluated the impact of EAI with respect to e-SCM (Rehan and Akyuz, 2010).

However, literature witnessed that technology plays a crucial role in business operations where AI, big data, IoT, and EAI are emerging and highly focusing domains of technologies (Hossain and Azam, 2023; Nagarajan et al., 2022; Rosa et al., 2022). The majority of BDA and EAI research was conducted in developed countries, often without taking supply chain considerations. Additionally, this study seeks to add to the theoretical body of knowledge by examining the moderating impact of EAI between BDA and corporate SCP. Additionally, by including evidence from developing countries, this study closes a gap in the literature. This study's empirical testing, which is yet another original contribution, is an intriguing fact. Most previous research has considered enterprise performance in addition to SCP. In particular, there is no study that specifically explains the role of EAI and BDA in the context of corporate SCP from China and developing countries. China is an emerging country that placed first in terms of population (Zhao et al., 2022). Exploring the relationship between BDA and EAI capabilities may help Chinese SMEs operate more efficiently in terms of corporate SCP.

This study aims to accomplish two main goals in this regard. The first goal is to investigate the relationship between BDA and corporate SCP in the SMEs of emerging countries like China. The second goal is to provide the moderating relationships of EAI between BDA and corporate SCP, respectively. Besides, the following is the arrangement of the study. After the introduction section, the literature, theoretical underpinnings, and proposed relationships are reported. The techniques, tools, and employed methods are all included in the methodology section. The study's findings following the application of SEM tools were also reported. For academics, practitioners, and international scholars, the conclusion offers discussion, theoretical and managerial ramifications, as well as opportunities for future research.

## 2 Literature review

The resource-based view (RBV) or theory is one of many that supports and motivates the organisation (Battisti et al., 2022). RBV encourages businesses to carefully assess their most valuable resources that can be used to achieve success factors, particularly long-term (Battisti et al., 2022; Kraaijenbrink et al., 2010). To gain competitive advantages over time, this theory also assists the business in defeating its rivals (Khan et al., 2019; Mahoney and Pandian, 1992). Numerous experts around the world have used RBV as the foundation for their research in various fields and viewpoints (Battisti et al., 2022; Khan et al., 2019; Mahoney and Pandian, 1992). Although security and privacy are of the major concerns and challenges in the world of technology (Mohanta et al., 2022; Moussaid and Azhari, 2020), still organisations are high to enable certain technologies for improving business performance such as BDA and EAI. It is important to investigate the current hypothesised connections between BDA and EAI on corporate SCP in the context of SMEs in developing countries like China using RBV theory and practice. According to academic research, BDA is crucial for the long-term viability and success of businesses, and many companies are integrating BDA into their daily operations (Elgendy and Elragal, 2014; Khanra et al., 2020; Russom, 2011). Numerous authors have previously explored the significance of BDA and EAI from various angles, focuses, and areas outside of supply chain management (Elgendy and Elragal, 2014; Erasala et al., 2003; Gorkhali and Xu, 2016; Khanra et al., 2020; Puschmann and Alt, 2001; Russom, 2011). Therefore, it is worth mentioning exploring the nexus of BDA and EAI in terms of corporate SCP from the perspective of SMEs within a developing nation, China.

### *2.1 BDA and corporate SCP*

BDA is defined as the complex process that supports understanding technology-related capabilities, including hidden information, trends, patterns, and additional data for controlling stakeholders (Elgendy and Elragal, 2014; Khanra et al., 2020; Russom, 2011). BDA is crucial for business success, and many businesses are implementing it in their daily operations (Kambatla et al., 2014). Researchers have identified a variety of BDA capabilities, which can be divided into two main categories (Gupta et al., 2020b). Another study divided it into four streams: traceability capabilities, analytical capabilities, decision support capabilities, and predictive capabilities (Wang et al., 2018). The experts concurred that BDA is crucial for organisational success, which ultimately helps organisations gain competitive advantages (Elgendy and Elragal, 2014). Reducing

operational efforts, like inventory reduction, along with cost-saving (Gupta et al., 2020b; Rehman et al., 2022). It enables businesses to organise their data management. In the past, many experts have concentrated on BDA's capabilities to provide its significance in conducting their studies across a variety of domains (Elgendy and Elragal, 2014; Gupta et al., 2020b; Khanra et al., 2020; Rehman et al., 2022). Due to the enormous importance of BDA capabilities in industries, we made the following assumption in order to conduct an additional analysis from China, a developing country. This study will add more empirical data to the existing BDA literature as a result based on the below assumption.

H1 BDA capabilities have a positive connection with corporate SCP.

### *2.2 Moderation of EAI between BDA and SCP*

EAI is defined as the way in which organisations use distinct software and computer-based programs to integrate different applications to enhance the operational efficiency of the organisations (Gorkhali and Xu, 2016; Irani et al., 2003). In the past, experts attempted to assure the impact of EAI in different themes other than corporate SCP (Erasala et al., 2003; Irani et al., 2003; Puschmann and Alt, 2001). EAI practices have been taken into consideration by academics to investigate its nexus with regard to various dimensions and perspectives (Erasala et al., 2003). A study uncovered the connection of EAI in terms of business performance (Freire et al., 2019). Another study evaluated the impact of EAI with respect to e-SCM (Rehan and Akyuz, 2010). Several researchers used the EAI as an important factor for organisational success and sustainability (Erasala et al., 2003; Gorkhali and Xu, 2016; Puschmann and Alt, 2001; Rehan and Akyuz, 2010; Soomro and Awan, 2012). In the past, some experts utilised EAI as an intervening factor among different factors and showed the significant importance of EAI within distinct perspectives and themes, worldwide (Madhusudan, 2004). How EAI may improve the relational strength of BDA and corporate SCP is a key to explore in the present instant. EAI capabilities are essential for transforming organisations into productive ones (Erasala et al., 2003; Gorkhali and Xu, 2016). According to previous academics, EAI aids the business in gaining competitive advantages (Puschmann and Alt, 2001; Rehan and Akyuz, 2010). Furthermore, a study revealed relationships between EAI and e-commerce (Erasala et al., 2003). Another study uncovered the connection between EAI and stock price (Roztocki and Weistroffer, 2009). Due to the enormous importance of integrating enterprise applications into practices like SMEs, we made the following assumption in order to conduct an additional analysis from China. By doing this, this study will add more data to the body of knowledge about EAI. Therefore, the following hypothesis is formed to ensure the moderating influence of EAI between BDA and corporate SCP.

H2 EAI moderates the relationships between BDA and SCP.

## 3 Methodologies

At the present instant, a quantitative method was mainly used to examine the relationships among BDA and corporate SCP with moderation EAI within SMEs of China based on RBV perspectives. The respondents were carefully approached and requested to answer the questions from the sector of luxury fashion brands using a five-point Likert scale, inspired by past studies (Mehmood et al., 2019; Omer et al., 2016;

Rafique et al., 2018). The study emphasised on non-probability sampling approach to obtain the required dataset because this technique is considered as most cost-effective method owing to a known sample for the customers (Turban et al., 2022). This convenience method helps a comprehensive chance within the population being part of the study sample (Etikan et al., 2016). Moreover, with such a convenience approach participants of the focused population could meet certain criteria, including geographical proximity, easy accessibility, and easy availability, and mostly can obtain responses with the willingness of the respondents (Etikan et al., 2016). Most of the researchers further claimed that such a sampling method helps the researcher to collect data in an easier manner (Stratton, 2021). Data gathered from SMEs within three major regions of China such as Beijing, Shenzhen, and Shanghai.

We generated the sample size and collected it between the periods of March 2022 to June 2022 by visiting locations of different SMEs to approach related personnel working within those regions. To keep in mind the ethical concern, we first get the consent of each respondent by asking whether they can spare a little time to respond to our academic survey or not. Hence, after their consent, we provided the questionnaire to participants and gifted a ball pen to most of the respondents for their motivation and for their precious time for our survey.

### *3.1 Instruments and sample size*

A total of 750 surveys were circulated during the given time scales whereas we received back the response of 630 participants. Later, we carefully evaluated the whole responses for securitising purposes in case of missing information or improperly answered information of the respondents. Therefore, finally, we got 489 documents that were fine in all aspects and considered them for final data analysis purposes. Our questionnaire was distributed into sections such as the demographic section and core inquiry section regarding luxury fashion brands considering main latent variables, e.g., BDA, EAI, and corporate SCP. Among those, one is independent variables, i.e., BDA. While one is dependent variables, i.e., corporate SCP. Third, one intervening variable was considered as a moderator, i.e., EAI. All the scales were adopted from the existing studies to validate the results in the Chinese domain by providing empirical results. First, BDA was adopted from past work based on four major constructs (Wang et al., 2018). Second, EAI was adopted in past work based on 40-item scales and is currently treated as moderating factor (Bahli and Ji, 2007). Third, corporate SCP was adopted from past work based on ten-item scales and is presently treated as a dependent factor (Gunasekaran et al., 2001). Likewise, all the scales were picked from the existing work to validate the findings from another region with additional evidence from China.

### *3.2 Sample description*

Table 1 indicates a detailed description of the adopted sample size based on their demographic profiles. Out of 450 questionnaires, nearly 60% ratio of the respondents is male while 40% ratio of the respondents is female. The respondents' profiles were divided based on their education, age, marital status, gender, and income level as comprehensively reported in Table 1.

**Table 1** Respondent's profiles and information

| *Profiles of the target audience* | *Freq.* | *%* |
|---|---|---|
| Gender | | |
| Male | 299 | 61.15 |
| Female | 190 | 38.85 |
| Qualifications | | |
| Under graduation | 95 | 19.43 |
| Graduation | 145 | 29.65 |
| Post-graduation | 155 | 31.70 |
| Others* | 94 | 19.22 |
| Age | | |
| <20 | 120 | 24.54 |
| 21–26 | 140 | 28.63 |
| 27–33 | 130 | 26.58 |
| >34 | 99 | 20.25 |
| Marital status | | |
| Single | 304 | 62.17 |
| Married | 185 | 37.83 |
| Work experience | | |
| <6 | 93 | 19.02 |
| 7–10 | 89 | 18.20 |
| 11–14 | 154 | 31.49 |
| 15–18 | 98 | 20.04 |
| >19 | 55 | 11.25 |

Notes: N = 489. *Rest of the degree and diploma holders.

### *3.3 Data analysis techniques*

In the study, different methods were utilised to obtain the outcomes of the study based on selected variables such as BDA, corporate SCP, and EAI. First descriptive tools of the statistics were applied to generate basic information by following the recommendations of the experts (Fisher and Marshall, 2009). Second, validity using discriminant (Fornell and Larcker, 1981), convergent validity (Russell, 1978), reliability (Hair et al., 2013; Hu and Bentler, 1999), and correlation analysis (Taylor, 1990) were carefully carried to obtain desired results. The structural model was majorly considered to obtain the direct paths and indirect paths using SmartPls software (Hu and Bentler, 1999). The model fitness was considered to assure the level of significance of SEM model (Barrett, 2007). We used two factors such as NFI and SRMR to assess the SEM model assessment (Hu and Bentler, 1999). The values of NFI must be >0.7 and SRMR must <0.08 as presently are accurate according to the minimum requirement (Hu and Bentler, 1999). The utilisation of the above tools such as SEM inspired by past studies where experts furnished results based on such tools and methods (Gupta and Singh, 2023; Shahid et al., 2021; Waheed et al., 2017, 2018; Ahmad et al., 2023).

## 4 Data analysis and results

Table 2 ensures the description of the latent variable showing the pre-defined reliability of each factor such as BDA, corporate SCP, and EAI. It is observed that three main variables were adopted where one independent, one dependent, and one moderating variable were studied.

**Table 2** Constructs' description

| *Variable* | *Model* | *Indicators* | *Reliability* |
|---|---|---|---|
| BDA | Factor | 04 | 1.00 |
| EAI | -- | 43 | 1.00 |
| SCP | -- | 10 | 1.00 |

Note: BDA = big data analytics; SCP= supply chain performance; EAI= enterprise application integration.

### *4.1 Standard deviation, α, mean, and variance values*

Table 3 shows the outcome values for the variables' mean, SD, alpha, and AVEs. The experts have suggested suitable criteria for the values where AVEs should be less than 0.5 and alpha outcome values should be higher than 0.7 (Hair et al., 2013). The mean values are average values for each latent factor since many experts have provided such values in their studies to assure the averages of the factors (Hair et al., 2013; Hu and Bentler, 1999). The following results clearly indicate the suitability of the results as per the suggestions of the experts.

**Table 3** Constructs' description

| | *Mean* | *SD* | *AVEs* | $\alpha$ |
|---|---|---|---|---|
| BDA* | 3.241 | 1.024 | 0.654 | 0.781 |
| EAI** | 3.154 | 1.242 | 0.632 | 0.741 |
| SCP*** | 3.541 | 1.123 | 0.681 | 0.820 |

Note: *Independent factor; **moderating; ***dependent factor.

### *4.2 Validity of discriminant*

The validity of the constructs assures the authenticity of the adopted factors whether such factors are correlated to each other and to what extent are correlated (Colliver et al., 2012). According to the advice of the experts, this assessment could be carried out by comparing the square root of AVEs with the following construct values. In case, the outcome values after the square root of AVEs are greater than the following values of interrelationships then researchers recommended that construct validity exists (Fornell and Larcker, 1981; Hu and Bentler, 1999).

### *4.3 Correlation model*

The model of correlation was applied to confirm the relationships among variables of the research such as BDA, corporate SCP, and EAI. The criteria recommended by the expert

are considered to evaluate the values (Taylor, 1990). According to the experts, a greater outcome value toward 1.0 shows a higher correlation while lower values toward 1.0 show lower connections (Hu and Bentler, 1999; Taylor, 1990). However, negative outcome values represent the negative connections between variables. At present, the values indicate a positive association among latent variables as mentioned below in Table 5.

**Table 4** Validity of discriminant

| | *BDA* | *EAI* | *SCP* |
|---|---|---|---|
| BDA | *0.808* | | |
| EAI | 0.214 | *0.794* | |
| SCP | 0.301 | 0.221 | *0.825* |

Note: Italics are √AVEs; non-italics are interrelationships.

**Table 5** Model of correlation

| | *BDA* | *EAI* | *SCP* |
|---|---|---|---|
| BDA | *1.000* | | |
| EAI | 0.214 | *1.000* | |
| SCP | 0.123 | 0.354 | *1.000* |

Note: Higher values explain higher relationships and lower values explain lower relationships.

## *4.4 Construct validity and reliability*

To generate reliability and construct validity, the following outcomes are presented which are based on AVEs, composite reliability, and loadings of the factors. At the present instant, the validity of the latent variables is evaluated using two methods, i.e., AVEs whose values should be fewer than 0.5, and loadings whose values should also be fewer than 0.5 (Hair et al., 2013). However, the reliability particularly composite reliability was discovered using the advised criteria, even though experts advised that the outcome values be greater than 0.7 (Hair et al., 2013; Hu and Bentler, 1999). Results shown in Table 6 confirmed the accuracy and dependability of the study's adopted constructs, which the researchers said were an important step in the validation process (Tajuddin et al., 2017). Moreover, the outcome values for SD and means for each item are also shown.

## *4.5 Structure equation modelling*

The relationships between proposed latent variables like BDA, corporate SCP, and EAI were evaluated using SmartPLS and MS-Excel. The SEM method was developed as a result of earlier studies in this field that used a similar approach to find the path relationships (Ashfaq et al., 2021a, 2021b; Farrukh et al., 2021). BDA is treated as independent whereas corporate SCP is treated as dependent constructs.

A moderating factor, EAI was also considered to identify the connections among proposed relations between BDA and corporate SCP. The values of beta and level of significance were observed to take a decision regarding the relationships of the variable as per the suggested criteria. Table 7 infers the outcome values along with a decision on the hypotheses.

**Table 6** Construct validity and reliability

| | *Items* | *Loadings* | *AVEs* | *Reliability (composite)* |
|---|---|---|---|---|
| Big data analytics (BDA)* | | | 0.654 | 0.785 |
| | BDA-F1 | 0.712 | | |
| | BDA-F2 | 0.621 | | |
| | BDA-F3 | 0.548 | | |
| | BDA-F4 | 0.624 | | |
| Enterprise application integration (EAI)** | | | 0.632 | 0.801 |
| | EAI-F1 | 0.712 | | |
| | EAI-F3 | 0.621 | | |
| | EAI-F4 | 0.548 | | |
| | EAI-F5 | 0.712 | | |
| | EAI-F6 | 0.621 | | |
| | EAI-F8 | 0.548 | | |
| | EAI-F12 | 0.712 | | |
| | EAI-F14 | 0.621 | | |
| | EAI-F15 | 0.548 | | |
| | EAI-F16 | 0.712 | | |
| | EAI-F17 | 0.621 | | |
| | EAI-F19 | 0.548 | | |
| | EAI-F22 | 0.712 | | |
| | EAI-F24 | 0.621 | | |
| | EAI-F23 | 0.548 | | |
| | EAI-F25 | 0.712 | | |
| | EAI-F27 | 0.621 | | |
| | EAI-F30 | 0.548 | | |
| | EAI-F32 | 0.712 | | |
| | EAI-F33 | 0.621 | | |
| | EAI-F34 | 0.621 | | |
| | EAI-F35 | 0.548 | | |
| | EAI-F36 | 0.712 | | |
| | EAI-F39 | 0.621 | | |
| | EAI-F40 | 0.548 | | |
| | EAI-F42 | 0.712 | | |
| Supply chain performance (SCP)*** | | | 0.681 | 0.815 |
| | SCP-F1 | 0.712 | | |
| | SCP-F2 | 0.621 | | |
| | SCP-F3 | 0.548 | | |
| | SCP-F4 | 0.712 | | |
| | SCP-F5 | 0.621 | | |
| | SCP-F6 | 0.548 | | |

Note: *Independent factor; **moderating; ***dependent factor.

**Table 7** Hypotheses and decision

| *Relationships* | *Direct affect* | *Interaction effect* | *Sig.* | *SE* | *Decision* |
|---|---|---|---|---|---|
| H1: BDA →SCP | 0.245*** | -- | 0.000 | 0.0541 | Accepted |
| H2: BDA*EAI →SCP | -- | 0.124*** | 0.000 | 0.0120 | Accepted |
| AGE | -- | -- | | | |
| FIRM SIZE | -- | -- | | | |

Notes: Sig: 0.005. *Independent factor; **moderating; ***dependent factor.

## 5 Discussion and implications

For the empirical testing, we proposed two main hypotheses taking into account BDA, EAI, and corporate SCP. Results attested to the validity of the H1 hypothesis that BDA and corporate SCP have constructive relationships at ($\beta = 0.245$: $p = 0.000$); hence, H1 (BDA → SCP) is supported. Second, it proposed in H2 that EAI moderates the connection between BDA and SCP. The results affirmed the hypothesis at ($\beta = 0.124$: $p = 0.000$) therefore H2 (BDA*EAI → SCP) is accepted. Our findings with respect to BDA support a similar notion whereby experts suggested a positive nexus toward organisational performance, including corporate SCP and sustainable performance as conducted within unlike perspectives and themes, worldwide (Beier et al., 2022; Edwin Cheng et al., 2022; Gunasekaran et al., 2017; Gupta et al., 2020; Shabbir and Gardezi, 2020; Su et al., 2021). Similarly, our outcomes with respect to EAI support a similar notion whereby experts suggested a positive nexus of EAI toward distinct perspectives and contextualisation across the world (Erasala et al., 2003; Kamal et al., 2013; Khoumbati et al., 2006; Lubis et al., 2018; Puschmann and Alt, 2001; Rehan and Akyuz, 2010).

### *5.1 Implications*

EAI and BDA is usually acknowledged as an ability that indeed helps firms to understand different capabilities such as by understanding hidden information, pattern, trends, correlations, and information technologies of distinct stakeholders. BDA also encourages the firm to obtain insights into the existing generations by deploying innovative technological capabilities. Nowadays, technology has triumphed in business operations consequently firms may not ignore the essentiality of technology in their business that eventually enhance corporate SCP. In such a domain, it is direly needed to transform business operations from traditional to evolving processes where BDA and EAI could contribute a revolutionary role to optimise corporate SCP. Furthermore, the research on BDA and EAI is in the initial stage; therefore, scholars are attempting to uncover the significance of BDA and EAI to stipulate distinct evidence across the world. EAI has positive nexus between EAI and corporate SCP, as presently assured after implementation through SEM method which provides consistency with the previous results of the researchers in which they found BDA and EAI as valid predictors of organisational SCP. Hence, firms may achieve a level of sustainability by incorporating BDA in their business process along with the capabilities of EAI technologies. In addition, managers are encouraged to improve operational structure that helps to sustain

in the market which is critical to and to win over competitors whereby big data and EAI may improve industrial structure and can support in achieving corporate SCP.

## 6 Conclusions

This study summarised that BDA along with EAI may support the firms to optimise distinct operational aspects, particularly supply chain operations. The BDA model provides insights into how organisations can become quicker, smarter, and more competitive in today's competitive environment. This study specifically concluded that corporate SCP may be realised if businesses concentrate on integrating the BDA and EAI models. It is concluded that BDAs are the predictor of corporate SCP. It is concluded that EAI positively influences the connection between BDA and corporate SCP. Hence, this study encourages the SCM to integrate BDA and EAI in the present instant to win over the competitors. Additionally, the study has some limitations that academic researchers, decision-makers, and professionals may take into account in the future when gaining understandings of BDA, EAI, and corporate SCP, respectively. Such drawbacks are related to sample size, locations, and sampling process where experts may validate the current outcomes with additional sample size by considering different locations within the Chinese market and worldwide to provide more empirical connections.

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