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Role of Information System Strategies, Business Intelligence and Analytics used to Enhance Firm Performance: Mediating role of Innovation Ambidexterity

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Abstract

The objectiveof this research is to examine the aspects of Information System (IS) strategies, Business Intelligence, and Analytics (BI&A) used to enhance firm performance. The main purpose of this study is to assess the influence of IS strategy, BI&A impact on firm performance as well as to demonstrate the association of innovation ambidexterity between BI&A and firm performance. Statistically analyzed results were based on data obtained from a survey questionnaire filled out by 322 Indonesian, China, Japan, and Malaysian Small and Medium Enterprises employees. The findings revealed that IS strategies, business intelligence, and analytics use have a significant influence on firm performance. The findings also revealed that innovative adaptability is a mediating factor in the favourable relationship between BI&A use and business success. All of the hypotheses were supported and the partial least squares method was used to test them.

Keywords
Business intelligence; IS Strategies; firm performance; Innovation ambidexterity

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1. Introduction

Small and Medium Enterprises (SMEs) are defined and designated differently across countries and regions, typically by annual revenue, employee count, and sometimes industry. In the Asian states, the small business administration (SBA) defines SMEs as private, for-profit, non-subsidiary entities with less than 500 people and up to $21.5 million annual revenue. Similarly, SMEs are a recognized category of business enterprises in most developed nations. SMEs constitute a large portion of the developed world's economy. SME's account for more than 90% of enterprises and more than half of all jobs worldwide. They play a prominent economic and social role and have become a source of economic development (Llave, 2019). Considering SMEs' impact on world economies and the influence. Business Intelligence, and Analytics (BI&A) has on business performance, understanding how SMEs can adopt BI&A to help them grow and be competitive in an ever-changing world is essential. Because of globalization and ongoing technological developments, firms today face increased market competition and dynamism. Maintaining a competitive advantage necessitates firms innovating in two methods simultaneously: radically and incrementally (Ransbotham et al., 2016). In the face of an ever-rising stream of information, businesses are increasingly turning to BI&A for relevant visions, trends, and associations which can help them develop greater choices that maximize financial benefit (Baskerville & Dulipovici, 2006).

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In this context, BI&A refers to a set of procedures, technologies, applications, and systems designed at assisting a company in analyzing various business and marketplace data and data to help you better its judgmental ability (Chen et al., 2012). Furthermore, it allows for a meaningfully comprehensive knowledge study that incorporates the firm's diverse external knowledge, resulting in new, potentially viable solutions to difficulties (Katila & Ahuja, 2002; Kowalczyk & Buxmann, 2015). As a result, previous research characterizes BI&A as a strategic program that improves company performance and innovation potential (LaValle et al., 2011; Llave, 2019; Watson & Wixom, 2007). Despite BI&A's undeniable potential, which has sparked appropriately consistent enthusiasm throughout the corporate world, most businesses that have implemented BI&A reported trouble gaining the expected competitive advantage, owing to a failure to act on the information they have been given (Barton & Court, 2012; Ransbotham et al., 2016). Several companies are likewise disappointed by overhyped technology potential, naive to the reality that the environment in which the importance of the offered insights and data revealed is critical. On the other side, the current study is limited and eventually inconclusive, offering neither theoretical foundation nor empirical proof to support the soundness of transforming BI&A's insights and data into operationally increased innovation capabilities. The majority of previous research appears to be stuck on a simple identification of relation among BI&A applications and creativity, meaning that development is just the result of expanding the variety and capacity of existing data and visions (Kiron et al., 2012; LaValle et al., 2011; Roberts & Piller, 2016).

Although current research shows the benefit of BI&A in enhancing innovation capabilities, scholars have recently asked for additional research into this value-added process, arguing that not every organisation visible to the same assortment and capacity of data and visions succeeds in using it through better innovation (Erevelles et al., 2016; Foss et al., 2011). As we know, globalisation will increase competition on a global scale (Bentley & Whitten, 2007; Ravichandran, 2018). Competing requires strategies that can use all of the power and potential; this may be accomplished if the organization can make the proper decisions based on the facts (Melhem & Zuqibeh; Wisna, 2013). As a result, strategies are focused on increasing an organization's competitive advantages in relation to the items it manufactures or services it provides to a given market or business sector (Banker et al., 2014; Croteau & Bergeron, 2001). Banker et al. (2014) indicate that Information System (IS) strategy includes efforts done by businesses to achieve their goals. IS strategy also encompasses the outcomes of decisions taken to direct an organization's efforts in the phase of the situation, architecture, and the procedures that influence its achievement (Banker et al., 2014; Chuang & Huang, 2018). Nevertheless, there is slight research that looks into the relationship between company strategies and IS (Bharadwaj et al., 2013) and business performance (Bento et al., 2014). IS strategies are ways that a company utilises to get a competitive position in the industry, and they include ways that the business uses to create choices (Porter & Millar, 1985), gaining a competitive advantage.

The limitations and challenges identified by organizations in prior research studies served as the impetus for developing the research problems for this study. These issues suggest that organizations aspire to increase firm performance, yet the majority of organizations just do not comprehend how to do it. As a result, the mentioned hurdles and research problems in data and business analytics make it difficult to grasp how to use data to accomplish business goals. The primary goal of this research is to assess the influence of IS strategy, BI&A impact on organizational value also to demonstrate the relation of innovation ambidexterity between BI&A and organizational value.

2. Literature Review and hypotheses development

The RBV is primarily based on the concept of building skills in resource use to gain a competitive edge (Barney, 2001; Cosic et al., 2015; Delen & Zolbanin, 2018; Gunasekaran et al., 2017). Many firms are more effective than others in the procedure of gathering resources and using them to develop different competencies (Peppard & Ward, 2016). To acquire a long-term competitive edge through these distinguishing qualities, resources must be valued, unique, scarce, and non-substitutable (Cosic et al., 2015). Given that, the data – obtained from the implementation of Business Intelligence &

Analytics (BI&A) – is viewed as one of the most essential assets for an organization to build strategies to enhance firm performance. Considering the theoretical groundings of RBV, the following framework, by incorporating the innovation ambidexterity, has been proposed for this study.

2.1. IS Strategy and firm performance

IS strategy is an organization's approach to managing its information systems. Organizational outcomes should be influenced by IT strategy. Rapid advancements in information technologies have impacted a variety of businesses, including information services, manufacturing, financial institutions, communications, and software solutions, over the last several decades. Information technology has effectively pervaded every industry and market, resulting in a fast-paced, very competitive, and worldwide environment (Baskerville & Dulipovici, 2006). Because technology advancements are rapidly driving change, regardless of the industrial sector, information systems (IS) play a crucial role in assisting organizations in maintaining the efficacy of their processes and activities. As a result, we argue that IS strategy, which directs the investment, organization, and use of information systems in an organization should be linked to company success.

The focus of information security strategy is on preserving stability and maximizing the utilization of current information security resources. Conservatives are unlikely to get a short-term competitive edge from the implementation of a new system since they do not aspire to be the first in their business to try an innovation. However, being a late majority adoption of technology can be advantageous to businesses. An innovative IS strategy is described as an IS strategy that demonstrates an organization's desire to be a leader in its industry in terms of information technology by pursuing new IT initiatives constantly. A conservative IS strategy provides an organizational view on creating value through a reliable and secure method by effectively refining and improving existing IS procedures.

In terms of information security strategy, firms that can follow the IS innovator approach regularly are likely to acquire unique skills over time through practise or experimentation (Ciborra, 1992) with diverse technologies. This practice serves as a learning instrument, allowing them to build both tacit and explicit knowledge, as well as the organizational skill to rapidly appraise the prospective of developing technologies to add their company strategy. In this technique, pursuing an advanced IS strategy continually enables the firm to establish dynamic skills, which are then used to react to fast-changing surroundings, whether those surroundings are marked by high technical volatility or very undefined marketplaces. IS entrepreneurs will thus be better ready to recognize trends, transform them into occasions, and survive in certain contexts, whilst their opponents may lack the capacity to respond to that various situations. As a result, we develop a hypothesis;
H1: IS strategy positively relates to firm performance.

2.4. Business intelligence and analytics use, innovation ambidexterity, and firm performance

The ability to create equilibrium among exploiting and exploratory development attempts to deliver gradual and drastic development for greater long-term success is referred to as innovative dynamic capabilities (Jansen et al., 2006). Incremental upgrades to established items that serve present customers and markets are known as exploitative innovations, on the other hand, exploratory innovations are significant alterations in new products that cater to new clients and markets (He & Wong, 2004). Exploratory innovation evaluates new structures and is related to flexibility, whereas exploitative innovation enhances products and promotes efficiency (Jansen et al., 2008). They are both linked to the learning of novel knowledge, albeit in diverse ways and to differing units (Gupta et al., 2006). According to scholars, the advantages of using business intelligence and analytics (BI&A) are numerous including better business outcomes and increased performance (Wamba & Mishra, 2017). While BI&A allows for a wide knowledge search, it also expands the firm's external knowledge, and potentially open up new problem-solving opportunities (Hayaeian et al., 2021). Given that, companies

can improve their outcome by converting an "intermediate outcome", for instance, a new service or the evolution of a new product into a "final outcome". Thus, following hypotheses are proposed.
H2: BI&A uses have a positive influence on innovation ambidexterity.
H3: BI&A uses have a positive influence on firm performance.

2.5. Innovation ambidexterity and firm performance

To be competitive and fulfil changing client needs, businesses continually develop novel technological advances in their goods and services (Jansen et al., 2006). However, the major purpose of the invention is to attain and sustain a high level of organizational performance. As a result, empirical data on the association between various innovation activities and company success are inconsistent (Camisón & Villar-López, 2014). A variety of theoretical explanations exist to support the positive impact of innovation on company success. A high degree of innovation enables a company to achieve "first-mover" benefits, improve its response to changing client demands, and minimize "lock-out" special effects (Siggelkow & Rivkin, 2006). Furthermore, innovative companies are more aware of opportunities in the external environment, and they are more proactive in utilizing new technologies (Hill & Rothaermel, 2003). Firms can launch new goods or services with improved or innovative features as a result of their greater responsiveness and proactiveness, which leads to improved profit, marketplace growth, and revenue. The consistent outlay in innovation can lead to subsequent innovation through the development of dynamic capacities for better company outcomes (Teece et al., 1997). Hence, next to the study by Benner and Tushman (2003), we claim that dynamic capacities are anchored in the overview of explorative and exploitative invention at the same time, rather than their rhythmic pacing. Furthermore, exploratory units are protected from the overwhelming management inertia evident in mainstream innovation attempts by the concurrence of these contrasting activities (Benner & Tushman, 2015). As a result, this study proposes:
H4: Innovation ambidexterity will positively influence firm performance.

3. Methodology

The research setting for this study is SMEs in Indonesia, China, Japan, and Malaysia that utilize BI&A tools for their companies. To begin gathering data for the research, the scholar emailed various SMEs in Indonesia, China, Japan, and Malaysia. The administrative department was approached for approval to perform the survey, and the research aims and goals were explained. The scholar also gave a confidentiality contract stating that the research data would only be used for this research and that the research results would be shared with the executives who granted permission for the survey to be conducted while maintaining the secrecy and privacy of their employees. To obtain final approval for data collection, the researcher also presented a sample questionnaire. The HR directors then provided a list of participants' email IDs although keeping the employees' names private to reduce unfairness and any ethical difficulties that might arise.

The researchers used a casual sample strategy to deliver 1000 questionnaires to many SME employees after obtaining the employee email address list. They chose every subsequent worker included in the HR directors which included participants' contact details. The data was gathered from respondents via an online survey via Google Form. Due to Covid-19 standards requiring social distance and limiting face-to-face engagement with employees, as well as the huge number of defendants, an online analysis was used to save money and time. In addition, compared to typical face-to-face surveys, the online survey gave faster replies with less bias and interference from the researcher, and a maximum of the workers were absent owing to task-from-home limitations imposed by the government due to the present epidemic situation.

An online questionnaire was formed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). It can assist scholars in determining the relationship between antecedent and outcome variables. The questionnaire comprised of two sections. The first section was

composed of demographics, such as employee age and gender, as well as SME employees' experience. The second section included elements about the study's latent variables IS strategy (innovative IS strategy, conservative IS strategy), BI & Analytics use, innovation ambidexterity (exploitative innovation, exploratory innovation) and firm performance. In February 2020, the questionnaire was distributed to 1000 randomly selected SME employees. The participants were issued 2 reminders and the researcher obtained complete 495 responses out of the total disseminated questionnaires at end of the 1st week of May 2020. For the 1000 initial questionnaires distributed, 485 complete replies were obtained, yielding a response rate of 49%. After screening of incomplete responses, missing values, or outliers, 322 responses were further used for statistical analysis. To prove the research aims and hypotheses, descriptive and correlation analyses were performed to examine each section of the data gathered.

3.1. Instrument

The six variables of interest in this research IS strategy (innovative IS strategy, conservative IS strategy), BI&A use, innovation ambidexterity (exploitative innovation, exploratory innovation), and firm performance were being used. The items for IS strategy (innovative and conservative IS strategy) was adopted using items from Chen et al. (2012), items for BI&A use were adopted from Gold et al. (2001), items for innovation ambidexterity were adapted from Jansen et al. (2006). To measure firm performance, items were adapted from Li and Atuahene-Gima (2001).

Table 1. Analyze the Population

Population	Categorization	Frequencies	Ratio
Age	<20 Years	23	7%
	20-30 Years	75	23%
	31-40 Years	104	32%
	41-50 Years	96	30%
	>50 Years	24	7%
Gender	Male	150	47%
	Female	172	53%
Industry	Real estate,	76	24%
	Hotels & restaurants	97	30%
	Telecom	118	37%
	Other	31	10%
Respondent position	Chief Information Officer (CIO)	12	4%
	IT manager	93	29%
	BI manager	76	24%
	CEO	11	3%
	Chief Financial Officer	77	24%
	Business executives	53	16%
Employees Experience	<5	92	29%
	between 5-15	106	33%
	15-30	74	23%
	30-40	30	9%
	40-50	20	6%

3.2. Tools for Data Processing

SPSS and Smart-PLS have been used to analyze demographic factors and test proposed hypotheses.

4. Results

4.1. Analyze the Population

The online survey approach was employed in this research to obtain data from Indonesia, China, Japan, and Malaysia SMEs. The sample contained 783 (73 %) males and 211 (27 %) females. The defendants in the survey ranged in age from 20 to above. The lesser amount of ratio was noticed for < 5years (27%) and more than 40 years (4%). The demographic variables are described in detail in Table 1.

4.2. Measurement model analysis

The measuring model assessment evaluates the items as well as the constructs they are linked to. To validate measures and evaluate the hypothesis, this study used the partial least squares analysis technique with SmartPLS 3.3. The AVE values of .50 to .68 were all more than .5, indicating the convergent validity. Moreover, a range of all VIF values from 1.19 to 3.58, was less than 10, showing the absence of multicollinearity (Hair Jr et al., 2017). The validity of discriminating is examined as the second standard for assessing insightful models. Consequently, compound dependability was obtained criterion.

Table 2. Measurement Model

	INS	COS	BIA	EXP	EYP	FP
Innovative IS strategy	.86					
Conservative IS strategy	.51**	.81				
Business intelligence & Analytics	.32**	.29**	.80			
Exploitative innovation	.16*	.24**	.33**	.81		
Exploratory innovation	.13**	.27**	.18**	.26**	.87	
Firm performance	.23**	.14**	.21**	.12**	.49**	.72

All of the items' standardized loadings beat the recommended threshold .5. Using Exploratory Factor Analysis, we investigated the study question on 18-variables for determining accuracy of the concept.

Table 3. Factor Loading

Variables	Items	Cronbach's Alpha	Factor Loading	Composite Reliability	Average Variance Extracted
Innovative IS strategy	INS1	.83	.89	.89	.73
	INS2		.80		
	INS3		.88		
Conservative IS strategy	COS1	.78	.79	.84	.65
	COS2		.84		
	COS3		.78		
Business intelligence & Analytics	BIA1	.76	.91	.84	.64
	BIA2		.78		
	BIA3		.69		
Exploitative innovation	EXP1	.82	.87	.85	.67
	EXP2		.76		
	EXP3		.79		
Exploratory innovation	EPY1	.75	.90	.79	.74
	EPY2		.89		
	EPY3		.79		
Firm performance	FP1	.80	.90	.89	.52
	FP2		.89		
	FP3		.89		

An EFA was used using the Bartlett Sphericity test and the (KMO) sample measurement in all data set to assess sampling adequacy and multivariate normality was studied. For factor analysis, Bartlet's Sphericity test must yield a statistically significant result, and samples must have a KMO acceptable amount is 0.5 or greater. Following a comprehensive analysis of the final data set, suitability was exceptional and produced a statistically substantial result (.865).

4.3. Structural model analysis

PLS-SEM was used to examine the significance and relevance of the constructs using 322 samples and bootstrapping. Table 4 sums up the results of all hypotheses. The direct influence of IS strategy on firm performance is represented in Table 4. The results of H1 are confirmed by the fact that the value are above the benchmark β = .312, t = 2.249, P = .050. The study suggests that IS strategy has a significant effect on firm performance. The value of β = .352, t = 4.231, p = .001 supports the results of H2. This suggests that BI&A has a significant effect on innovation ambidexterity. The value of β =. 433, t = 5.661, p = .000 supports the results of H3. This proposes that BIA has a significant impact on firm performance. The results of H4 are sustained (β = .325, t = 4.345, p = .001) indicating that significant influence of Innovation ambidexterity on firm performance. The study outcomes demonstrated that all hypotheses were assisted in the research; The consequences of hypothesis testing are summarized in Table 4.

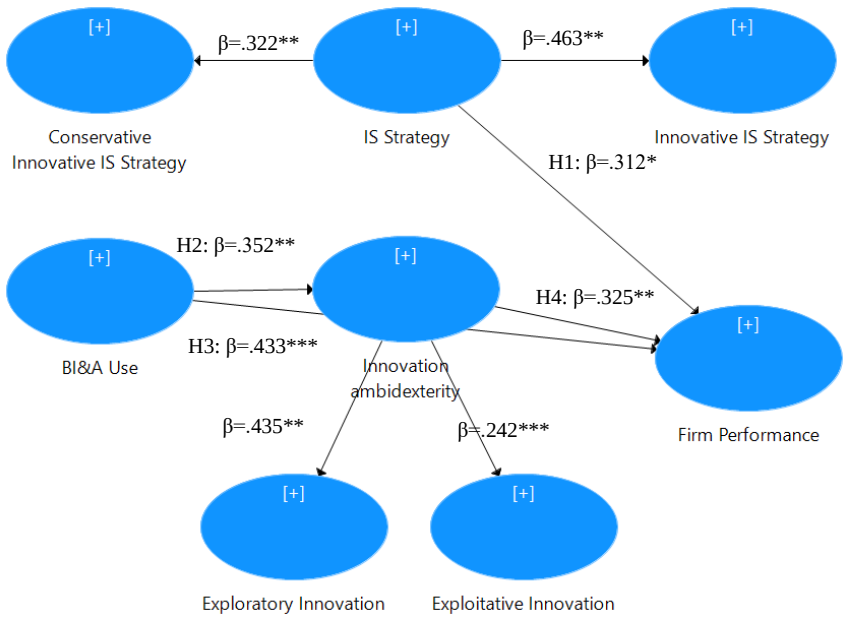

Figure 1. Framework

Table 4. Results

Hypotheses	Standardized Coefficient	T-Value	P Values	Results
IS Strategy --> Firm performance	.312	2.249	.050	Supported
BI&A --> Innovation ambidexterity	.352	4.231	.001	Supported
BI&A -> Firm performance	.433	5.661	.000	Supported
Innovation ambidexterity -> Firm performance	.325	4.345	.001	Supported

5. Discussion

This research examined the antecedents of IS strategy and BI&A use and a possible influence of innovations ambidexterity in the relation among BI&A use and firm performance. Results of current

research revealed that there is a link among IS strategy & business productivity, as well as BI&A usage and innovative ambidexterity. With anecdotal, conceptual, and empirical data, the existing study backs up the positive claims about the capacity of BI&A to boost organizations' creative abilities and corporate success. From a usage standpoint, the goal of this research was to better recognize the instruments through which BI&A adds to innovation ambidexterity and business success. Based on an earlier study on innovation, the study established and evaluated a study model that included the areas of knowledge management, information processing, and dynamic capabilities. The major outcomes indicate that BI&A adoption is connected with the capability to equal rival invention initiatives, which improves company performance. This relationship was mostly described by the firm's adoption of BI&A, which allows enterprises to utilize facts and their knowledge-subsidiary innovation capability. This research revealed that BI&A use is an essential factor to enhance firm performance. The result of this research also shows that IS strategy and BI&A use have a positive influence on firm performance.

6. Theoretical and Practical Contributions

From a theoretical standpoint, this work contributes to the current researchers on BI&A capabilities. We hypothesize BI&A use in a way that incorporates organizational and technology views, so enriching the BI&A conversation. We concentrate on examining and debating the basic skills of BI&A that firms must employ to be successful with BI&A. This contribution is significant since many businesses employ BI&A as an instrument without evaluating the various capabilities that can merit any amount of success. We offer evidence to aid the notion that BI&A endows firms with various capabilities through theoretical analysis and practical testing. Firms can employ these competencies to efficiently apply BI&A and, as a result, increase firm performance. In line with previous research, our findings imply that organizations must successfully employ BI&A to improve their outcomes. However, unlike previous research, we discovered that BI&A capabilities cannot be simply measured in terms of the instrument that businesses utilize or the analyses that they can perform using BI&A. Instead, there are various and multi-faceted BI&A capabilities at the operational and strategic levels. One capability, for instance, the innovation-infrastructure competence, comprises technical, governance, and cultural basics.

Our findings have significant implications for executives involved in BI&A employment. According to Ransbotham et al. (2016) , Numerous firms, willing to figure out how to apply the data and visions provided by BI&A, and enterprises that are effective in leveraging BI&A are more the exclusion rather than the rule. If practitioners want to positively turn BI&A uses into greater business performance, empirical research suggests that they should focus on increasing the firm's BI&A-reinforced innovation capabilities. Given the abundance of outdoor data and information, businesses should progressively more use business intelligence and analytics to assist underlying operations, so avoiding the constrained rationality phenomena. As well as providing useful information for innovation. As a result, businesses must devise strategies to encourage the growth of innovation ambidexterity, which as a result creates favorable conditions for various innovation. According to our findings, BI&A can be used to gain a competitive edge by fostering exploratory and exploitative innovation capabilities. Firms must apply the knowledge generated from BI&A to expand current goods and services as well as develop novel goods and services that are fundamentally different from those now available. While achieving a balance between these frequently contradictory innovation efforts is difficult, an imbalance here may result in competence traps that have a negative influence on long-term company success. As a result, practitioners must take advantage of the increasing range and richness of available information and expertise at the same time; and investigate strategies to assure more adaptability through rapid experimentation with the offers (goods or services). Thus, the value of future goods and services can be predicted more accurately. Firms must visualize the environment of organizational innovation and ensure that their use of BI&A meets their needs. Furthermore, everyone participating in the innovation process should have access to the BI&A insights, as well as a thorough description of the meaning and limitations of the results.

7. Limitations and Conclusion

Lastly, the research may have limitations about the extent of the factors we investigated. The impact of IS strategy and BI&A use on invention ambidexterity and employee retention is investigated in this research. However, because of time and scope constraints, we excluded additional elements such as competitive stress, institutional force, and other such outside factors that may influence BI&A efficiency and organizational performance. As a result, we need more study that takes into account all of the variables to fully comprehend the success of BI&A. While this analysis is mostly based on RBV assumptions, there is considerable room for scholars to analyze the relation among BI&A utilization and business success through a diversity of theoretical lenses. The objective here is to inspire scholars to pursue this subject further, for instance, by employing stakeholder theory, institutional theory, and other theoretical views derived from the domains of strategy and organization.

This research examines the association between IS strategy, BI&A utilization, innovation ambidexterity, and company success using both theoretical and empirical evidence. Using the RBV theory of IT strategy to produce value in the particular setting of BI&A as well as the innovation perspective. According to the findings of this study, BI&A uses are significantly related to innovation ambidexterity, which leads to improvements in firm performance. The link between BI&A utilization and innovation ambidexterity may be described in several methods, including increased opportunities for speedier experimentation with product or service offers and improved prediction of the value of novel goods or services. The results have practical implications on the essential interaction of various dynamic skills to acquire strategic benefits from the usage of BI&A and by executing IS strategy.

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