An empirical research in Jordanian enterprises looked at business intelligence competency, top management commitment, and organizational effectiveness in supply chain management

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ABSTRACT

This study aims to examine the business intelligence in supply chain performance by examining the correlation between business intelligence competence, top management commitment, and supply chain performance.Quantitative research design is used to attain the goals. The researchers sent the online survey form to 232 businesses via email. The data received from Jordanian businesses is analyzed using structural equation modelling (SEM). The findings provide credence to the concept of business intelligencesupply chain competency as a multi-dimensional construct that includes management, cultural, and technical.The results of the study demonstrate that there is a substantial association and positive between business intelligence competency, top management commitment, and supply chain performance. Academics and practitioners, especially companies, are given the study's implications. The limits have been emphasized, as well as a suggestion for future research.

***Keywords*:** *business intelligence competence, top management commitment, supply chain performance, Jordan*

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1. Introduction

In today's world, businesses are becoming more aware of the importance of knowledge and expertise. Business software and systems, including customer relationship management, Supply Chain(SC) management, and enterprise resource planning, have received significant investments, and as a result, the business systems have evolved into the foundation upon which an organisation is built (Ghazanfari & Rouhani, 2011; Foshay & Kuziemsky, 2014; Lee et al., 2022). On the other hand, companies are indeed attempting to create a competitive advantage in their industries. The requirement for efficient instruments to enable the analysis and use of data gathered by these systems for decision making has become more vital than ever. Business Intelligence (BI) is considered as a reaction to contemporary demands in terms of appropriate, rapid, and simple access to pertinent information via intense utilisation of information technology, providing managers with the ability to make better-informed decisions in a range of organisational scenarios (Petrini & Pozzebon, 2009; Razmi et al., 2009; Rouhani et al., 2012; Lee et al., 2022). The Gartner Group's Howard Dresner coined the phrase "business intelligence" in 1989 to characterise a combination of concepts, methodologies, and procedures for enhancing the decision-making processes of corporations via the use of fact-based support systems (Elbashir et al., 2008; Gartner, 2012). BI is becoming more prevalent in the company's world as the importance of making decisions and analysing information efficiently and effectively grows at the tactical, operational, and strategic levels. As reported by Muller et al., (2010), and Gartner, (2012) worldwide expenditure on BI systems and associated

goods, including performance management software and analytics, increased from $10.5 billion in 2011 to $12.2 billion in 2011, reflecting the rising strategic relevance of the technology. However, a review of the literature revealed that it has gotten less attention, and many of the categories and methodologies in BI study remain unexplored. Furthermore, since modern enterprise competition has migrated from single enterprises to SC, the competitiveness of an enterprise's SC is becoming considerably vital to company success (Jourdan et al., 2008; Cabral et al., 2012). SC agility is recognised as a vital aspect of competitiveness in today's constantly changing environment, allowing businesses to develop a superior position by responding effectively and quickly to market volatility and other uncertainties (Li et al., 2008; Gligor & Holocomb, 2012). It is the SC's ability to deal with turbulence and unexpected changes in a competitive market and business environment, as well as to provide a strategic advantage by converting uncertainties and threats into opportunities by rapidly and unexpectedly assembling the necessary assets, knowledge, and relationships (Gligor & Holocomb, 2012; Yang, 2014; Lee et al., 2022). Although the literature has examined the role of information technologies and systems (IS/IT) in attaining agility, little prior study has merged the BI and agility topics in the context of the SC (Moron and Swierczek, 2009; Ngai et al., 2011; Ralston et al., 2013). People are interested in BI because it is separate from other IS/IT systems and has its own set of characteristics and impacts. According to Lehtisalo, (2018), research on industrial real-world d applications, notably in enterprises, is still lacking. Firms from varied trade settings have different Business Intelligence Supply Chain (BISC) policies, procedures, and practises. As a consequence, further research is required to create BISCframeworks for each industry in order to better understand the critical trends for the future BISC. According to a few polls, the majority of academics feel that BI aids in the resolution of SC operations. As a result, having a robust framework and structure to assist with BI deployment is crucial (Büyüközkan & Göçer, 2018). Furthermore, only a few studies concentrating on Jordanian businesses have investigated the relationship between senior management commitment to the BISC and SC performance. As a result, this study looks at the effect of BISC expertise on top management commitment and SC performance. Furthermore, as indicated in previous research, this study aims to meet the demand for empirical research on BI, namely the benefits it may provide for improved performance skills. In the parts that follow, we will discuss the literature review, research methodologies, research results, and recommendations for future research suggestions.

2. Literature review

2.1 Supply chain BI competence

There are various definitions of "business intelligence." An examination of the BI-related literature, according to Petrini and Pozzebon (2009), identifies two main methods of defining the concept: management and technical. BI is described as an organised and systematic method of gathering, integrating, disseminating information, and assessing from both external and internal sources that is relevant for revealing strategic business aspects and decision making reasons from a management standpoint (Jourdan et al., 2008; Lee et al., 2022). In this regard, the primary emphasis is on the process of producing and communicating the appropriate information to the appropriate individuals at the appropriate time, as well as the process of managerial decision making (Power, 2008; Bose, 2009; Ghazanfari et al.,

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2011). BI has emerged as an essential and rising tool, practise, and technology in the business world since the turn of the century. BI is being used by businesses of all sizes all over the world to promote their products and gain a competitive advantage. BI refers to the processes, technology, and tools that assist businesses in converting data into information, information into knowledge, and knowledge into plans that lead to smarter and more successful decision-making. Examples of BI tools and technology include online analytical processing, data mining, data warehousing, dashboards, analysis, and reporting. In this setting, BI's role is to aid the previously indicated BI process (Petrini&Pozzebon, 2009; Alzoubi et al., 2022). Indeed, the management and technology methods to BI collaborate to deliver actionable data to improve the decision making process. Lukman et al. (2011) developed the term "BI system" to define the integration of technology elements, such as software applications and tools, and procedures that allow the creation and transfer of accurate and possibly relevant information to managers at different organisational levels. Besides the technical perspectives and organisational perspectives, there is still another approach to categorising BI as a product. In this context, BI refers to actionable data and information about the company and its operating environment, including markets, products, technology, customers, suppliers, competitors, industry trends, and any other relevant elements (Alzoubi&Yanamandra, 2020; Alzoubi et al., 2022). This is a broad definition of BI that focuses on corporate data that aids decision-making. This type of data is generated by both the BI approach and the technology. BI from a product aspect may be understood as a result of the other two BI techniques. BI competence is defined as an organization's ability to build a BI product and use it to make effective and efficient business decisions. BISC competency is described as the capacity to deliver SC-related information and knowledge that facilitates SC decision making at several levels, spanning from outsourcing, strategic planning of networks, and procurement to thorough scheduling and lot sizing (Elbashir et al., 2008; Gartner, 2012). It contains information on the whole SC, as well as upstream and downstream SC partners and the general business environment. The SC's BI competency may be described in terms of administrative and technological aspects, according to the previously discussed idea of BI as a product. As a third component in developing BISC knowledge, we feel cultural competency is crucial (Lee et al., 2022). Cultural competence refers to the capacity of SC partners to create a successful BI culture. The culture of BI is one in which the significance of BI as a strategic asset for attaining success in the SC is widely acknowledged. Without a well-established BI culture, the BI benefits of tools and technology, as well as planned methods for modifying and analysing data, are unlikely to be realised and contribute to company success (Machuca& Costa, 2012; Mohamad &Jafar, 2014).According to Mohamad &Jafar (2014), BI culture in the context of the SC refers to intra-and inter-organizational cultural factors that influence the creation, sharing, and adoption of BI in the SC. It is largely focused on communication flows and information as well as the connections within the SC. As a result, the culture of BI in SC partners recognises trust and commitment as essential variables that affectboth sharing and quality of information, and without them, businesses will be hesitant to share relevant information that could improve SC decision making honestly and frequently (Mohamad &Jafar, 2014; Alzoubi et al., 2022). Other aspects include the cooperation and collaboration of SC partners both upstream and downstream, which can be

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assessed by the degree of collaborative problem solving and decision-making throughout the SC in areas including goal setting, planning, new product and process development, forecasting, inventory management, and so on (Muller et al., 2010; Machuca& Costa, 2012; Mohamad &Jafar, 2014). Table 1 outlines the three dimensions of BISC expertise that were previously highlighted.

Table 1.
Dimensions of BISC competence

Dimension	Definition	References
Managerial competence	The effectiveness and efficiency of the supply chain BI process, that is, the process of gathering appropriate data and knowledge to improve supply chain decision-making.	Petriniand Pozzebon (2009), Jalonen and Lonnqvist (2009), Bose (2009)
Technical competence	Technology, tools, and software applications that assist the supply chain BI process are available and used effectively.	Lin et al. (2009), Giovinazzo (2002), Petrini and Pozzebon (2009)
Cultural competence	Ability to build a strong and successful BI culture across the supply chain, including intra- and inter-organizational cultural components that drive BI production, sharing, and usage	Machuca and Costa (2012), Fawcett et al. (2007), Sangari and Razmi (2014)

2.2Top Management commitment

In the BISC, top management commitment is a vital aspect. The organization's top management will have the authority to allocate the resources needed to support the BISC. To carry out strategic transformation and system changes in a business, senior management commitment is required (Rakesh & Ravi, 2021). To achieve comprehensive environmental excellence, senior management commitment is essential (Zhu &Geng, 2013). By adopting proactive efforts for the BISC, leadership may provide a clear vision for addressing environmental challenges for company activities. The primary objective of top management commitment in quality management implementation in any firm is employee empowerment (Elbashir et al., 2008; Zhu &Geng, 2013; Yang, 2014; Rakesh & Ravi, 2021). The dedication of senior management can help to attain the quality goal more effectively. The devotion of top management enables their people to attain quality. According to several studies, top management commitment is the most important aspect in attaining a BISC since it improves communication and increases staff enthusiasm. Top management support is crucial for driving BISC decision-making methods, may motivate employees through rewards and incentives, and is critical for the effective deployment of the BISC (Kausar& Luthra, 2017).

H_1: *The dedication of senior management has a good impact on BISC competency.*

2.3 Supply Chain Performance

Organizations have utilised performance measurement to determine if tasks or activities are meeting their objectives. In a nutshell, performance is the measurement of job failure and success, including productivity and profitability. According to Agami et al. (2012), performance metrics in SCM may be used to determine if SC firms have risen or decreased. As a result, brief network supply performance may be simplified as a method of evaluating SC performance. Many scholars and corporations from all over the world have been interested in performance rating concerns in SCM since the late 1990s (Beamon, 1999; Lee et al., 2022). However, due to the numerous aspects that go into network supply, assessing network supply performance is a difficult undertaking. The primary goal of SC management techniques is to ensure customer happiness. All supply networks compete for clients based on the products or services supplied (Agami et al., 2012; Foshay&Kuziemsky, 2014; Kausar& Luthra, 2017). Making suppliers a part of the company's strategy is one of the keys to efficient SC management in addressing the rising market. The SC management concept stresses integrated patterns in the manufacturing flow from raw materials to goods in the hands of customers. Activities that occur throughout the process must be assured that the flow is smooth and free of boundaries/dividers so that the information mechanism can operate transparently without a break in one of the linkages. Implementing SC management will lower operational expenses along the chain, assuring product quality and eventually contributing to offering value to customers in terms of product availability and service timeliness. Thus, SC management will give a competitive edge both directly and indirectly, particularly in terms of product value.

The scope of SC management is significantly greater than the idea of logistics. According to one definition, SC management is a unified business process that extends from original suppliers, who give goods, services, and information in order to deliver additional value to customers through end users. According to Gunasekaran et al. (2004), SCM is critical for gaining a competitive edge and increasing organisational productivity and profitability. As a result, an effective performance measurement is required. According to Ibrahim and Ogunyemi (2012), many companies nowadays are continually overlooking ongoing SC development. One of the reasons some firms fail to utilise their SC's viewpoint is that they fail to define the performance measures and indicators in the first place. Beamon (1999) develops a framework for SC performance metrics, which comprises three categories of performance measures: flexibility, resources, and outputs. However, Gunasekaran et al. (2004) stated that no single declaration about the optimum SC performance measurements has been made by prior academics. To assess SC performance, Jeong& Hong (2007) used delivery dependability, responsiveness, flexibility, cost, and efficiency as metrics. In the same year, Lee et al. (2007) performed the same measurement using cost containment and reliability metrics. Sezen (2008) looked at SC performance in terms of flexibility, output, and resource use. Lee et al., (2022) opted to measure SC performance using the variables of cost, flexibility, relationship, and responsiveness. Researchers opted to use three SC performance metrics based on the literature. To begin, there are resource measurements such as cost and inventory levels that are connected to the efficiency of employing resources in network supply. The production outputs, such as filling rates, on-time delivery, customer response time, and flexibility measurements, come next.

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H_2:*BISC proficiency has a favorable impact on SC performance.*

H_3: *The devotion of top management has a favorable impact on SC performance.*

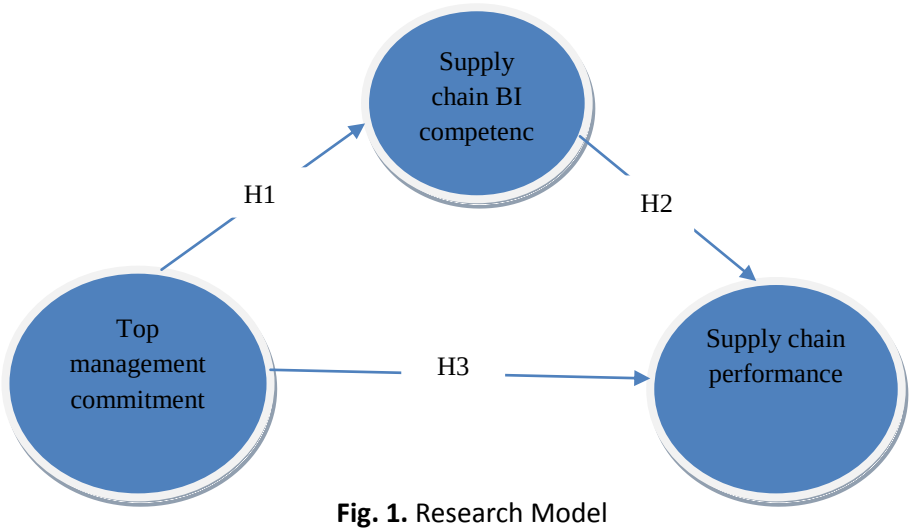

Fig. 1. Research Model

3. Method

3.1 Population and sample selection

For data collection and sample selection, this study employed a qualitative technique based on a questionnaire. The study's main goal was to look at the link between senior management commitment to the BISC and SC performance, with a focus on Jordanian companies. The majority of data was obtained using self-reported questionnaires created with Google Forms and sent through email to a select sample of managers at various levels. There were a total of 249 responses, 17 of which were declared inappropriate for statistical analysis due to missing or incorrect data. Consequently, the final sample consisted of (232) analysis-appropriate responses, which was adequate to the degree that was anticipated and permitted a data saturation assumption(Sekaran & Bougie, 2013).

3.2 Measurement instrument

The measuring instrument consisted of a self-reported questionnaire that was divided into two core parts and one component that focused on control factors. As control factors, gender, age group, educational level, and experience were employed as categorical measures. To deal with the two primary components, a five-point Likert scale (from 1 to 5 = strongly disagree) was utilised. To investigate the study constructs, a questionnaire with self-assessed ratings was created.Based on the literature review and interviews with a number of SC and BI experts and practitioners, we developed a set of measurement scales for each of the three aspects of BISC competency, namely technical, managerial, and cultural. The effectiveness and efficacy of the manyvariables of the BI process within the context of the SC, as outlined in the BI literature, were utilised to assess managerial competency. Similarly, nine questions were developed to assess technical competence by assessing effective use of key tools and

technologies based on technical definitions of BI. Furthermore, eight characteristics were utilised to measure cultural competency, including attitudes about using BI in SCM operations and its importance as a strategic asset in achieving success, the quality of information and communication flows among SC players, trust, and commitment. Furthermore, to analyse SC performance, 15 items specific to analysing BISC and 8 items dedicated to measuring SC performance were employed.

4. Findings

4.1 Measurement model evaluation

This research tested hypotheses using structural equation modelling (SEM), a modern statistical technique that was employed for assessing and quantifying the connection between factors and variables.As a consequence, the validity and reliability of the components were evaluated using confirmatory factor analysis (CFA) using the statistical tool AMOSv21. The findings of convergent and discriminant validity, as well as the reliability indices, are summarised in Table 1. In addition, Table 2demonstrates that the various items' standard loading values were all within the domains' acceptable range (0.624-0.881), which was greater than the elements' minimal retention based on their standard loads (Alzoubi et al., 2022).

The extracted average variance (AVE) is a summary measure of concept convergent validity that must be larger than 0.50. Hair et al, (2016)all constructs had AVE values more than 0.50, suggesting that the measurement methods used had good convergent validity. Hair et al, (2010)presented the comparison method in covariance-based SEM to deal with discriminant validity evaluation. Maximum shared variance (MSV) values are compared to AVE values, and square root of AVE (AVE) values are compared to the correlation between the remaining structures. The results show that MSV values were lower than AVE values, and AVE values were higher than correlation values across the other components. As a result, the applied measurement model exhibits discriminative validity. Internal consistency (as judged by Cronbach's Alpha) and compound reliability (as measured by McDonald's Omega) were employed to evaluate the measurement model. As indicated in Table 1, the Cronbach's Alpha and McDonald's Omega coefficients were both more than 0.70, the lower limit for assessing measurement reliability(Ramirez et al, 2013).

Table 2
Results of validity and reliability tests

Constructs	1	2	3
1. TMS	**0.755**		
2. BISC	0.745	0.676	
3. PSC	0.718	0.698	0.739
VIF	2.654	2.741	2.524
Loadings range	0.670- 0.846	0.691- 0.817	0.674- 0.852
AVE	0.587	0.532	0.553
MSV	0.482	0.427	0.437
Internal consistency	0.876	0.829	0.859
Composite reliability	0.892	0920	0.908

5.2 Structural model

As indicated in Table 1, since variance inflation factor (VIF) values were less than 5, the structural model did not exhibit multicollinearity amongst predictor components. Hair et al., (2016) the model fit indices values shown in Fig. 2 support this conclusion.

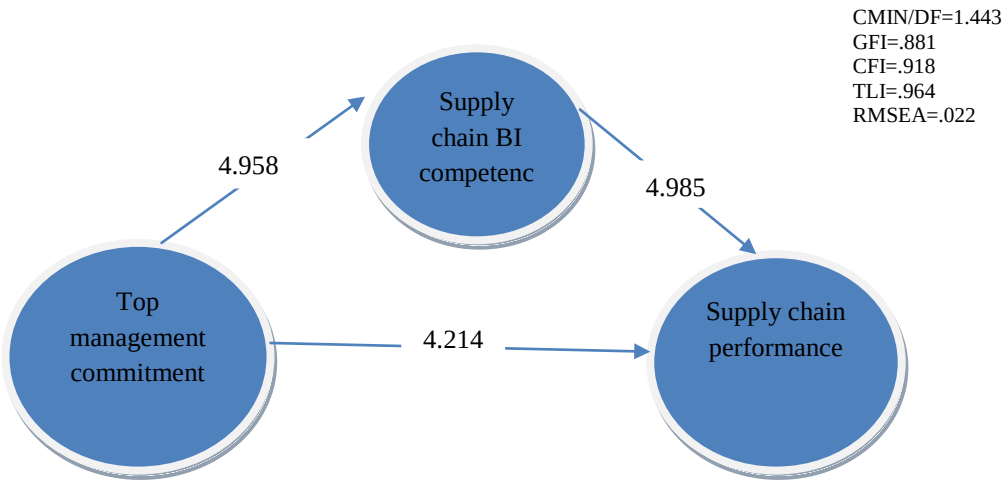

Fig. 2. Research Bootstrapping Results

The chi-square to degrees of freedom (CMIN/DF) was 1.443, which is less than 3 the top limit of this indicator, as shown in Fig. 2. The goodness of fit index (GFI), comparative fit index (CFI), and Tucker-Lewis index (TLI) were all greater than the 0.90 minimum acceptable criterion. Furthermore, the root mean square error of approximation (RMSEA) resulted in a value of 0.022, which is a tolerable approximation error because it is less than the upper limit of 0.08. As a result, Table 2 below clearly demonstrates that the research model based on the evaluation is sufficient to proceed to the discussion of research hypotheses. SEM was used to validate the outcomes of evaluating the research hypotheses.

Table 2
Path Coefficient Test Results

Hypothesis	Relation	Standard Beta	*t* value	*p* value	Results
H1	TMSBISC →	0.613***	28.35	0.000	Supported
H2	TMS PSC →	0.567***	27.54	0.000	Supported
H3	BISC PSC →	0.587***	25.93	0.000	Supported

The direct influence and linkages between the study variables have been thoroughly acknowledged, as have all of the search hypotheses.

5. Discussionand conclusion

Regardingtechnical, managerial, and cultural competence, the empirical findings provide credibility to the idea of BISC competency.

Previous study has revealed a differentiation between several methods to BI and a complementary interaction between them; hence, the multidimensionality of this concept may be supported (Gartner, 2012; Foshay & Kuziemsky, 2014; Mohamad & Jafar, 2014; Lee et al., 2022). It suggests that, while well-defined procedures and the use of suitable tools and technology are both essential, they are insufficient to provide the BI outcome, i.e. relevant information and knowledge that supports SC decision-making tasks in an effective and efficient manner. In fact, beliefs, values, norms, and practises, as well as other characteristics of intra- and inter-organizational culture, impact the creation of the BI product. As a result, the foundation upon which BI processes and technologies operate must be a robust and supportive BI culture among SC partners. This is consistent with previous research highlighting the significance of knowledge and information culture in attaining organisational success (Agami et al., 2012; Foshay & Kuziemsky, 2014; Alzoubi & Yanamandra, 2020). Furthermore, SC BI competency has an impact on SC performance both directly and indirectly. These findings suggest that SC competency in BI processes, technologies, and culture is linked to increased SC performance, particularly in those aspects that define success and competitiveness in a dynamic and chaotic business environment. The direct impact relates disparities in SC performance to differences in BI competence, highlighting the importance of BI competence as a key corporate resource. The arguments in the literature on the favourable benefits of BI in the SC setting can justify the empirical data on this relationship (Büyüközkan & Göçer, 2018; Lehtisalo, 2018). Prior study has also highlighted the relevance of information/knowledge-related capabilities in boosting SC competitiveness and agility (Ghazanfari et al., 2011; Ghazanfari & Rouhani, 2011; Cabral et al., 2012; Zhu & Geng, 2013). The devotion of Top Management is the next influential element. In order to build and enhance a sustainable SC, a company's senior management must be committed to sustainability. In a SC, senior management support gives strategic power to meet social, environmental, and economic goals (Yang, 2014). In the future, SSCM will grow more complex, and effective sustainable development will require active engagement from senior management. Their ability to integrate SSCM into overall performance objectives will be important(Rakesh & Ravi, 2021). Based on the partial test findings, it was discovered that top management commitment has a positive and considerable impact on company performance. The top management commitment variable is critical for companies to examine when looking to improve their financial and operational performance. The results of this research are consistent with those of Rakesh & Ravi, (2021), who found that top management commitment has a strong favourable impact on business performance. As a result, all of the study's hypotheses have been validated.

6. Conclusions

The current study looked at a conceptual model of BI expertise, top management commitment, and SC performance. To determine the links among the model components, a set of assumptions was created based on theoretical frameworks and current literature. According to the empirical data, BISC competency has a beneficial impact on top management commitment and SC performance. As previously indicated, this study's sample is limited to automotive industry enterprises, and those who participate in the survey must comply to ISO/TS, the quality management standard in the automotive SC.A successful business is one that

can meet customer demand by delivering products on time, at the appropriate price, and in the right quantity.SC management is the major determinant of the company's competitive advantage in this situation. Companies with greater SC performance are currently more likely to win the competition.This might have an impact on their SC performance metrics including quality, productivity, and delivery. To improve our analysis and give more clear and generalizable conclusions, further empirical investigations encompassing a wide range of different sectors are required. In addition, instead of subjective evaluations, more objective, quantitative scales may be evaluated and used in future study to create more accurate findings.Furthermore, rather of subjective judgements, more goals, and quantitative scales may be evaluated and utilized in future studies to create more accurate findings. Given the comprehensive definition of BISC competency, which covers competencies in BI process, BI technology, and BI culture, the results of this research provide early evidence for the positive impact of emerging BI trends like as Big Data, Cloud BI, in-memory analytics, and others. Nevertheless, future study should look at how they connect to the dimensions of BI knowledge as well as the capabilities and performance of the SC. Further study may be undertaken to investigate the influence of other supply network variables on the found relationships, such as SC size, supply chain unpredictability, and so on.

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