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THE IMPACT OF SUPPLY CHAIN MANAGEMENT PRACTICES ON COMPETITIVE ADVANTAGE: THE MODERATING ROLE OF BIG DATA ANALYTICS

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ABSTRACT

Purpose: The current study aims to investigate the moderating role of Big Data Analytics (BDA) on the relationship between supply chain management practices (SCMPs) and the competitive advantage (CA) in the Jordanian manufacturing firms.

Design/methodology/approach: Quantitative method was used to collect data from 156 Jordanian manufacturing companies. And hierarchical linear multiple regression using SPSS technique was used to test the study hypotheses.

Findings: The results show significant positive impact of SCMPs on CA. Specifically, a significant positive impact is found between information quality (IQ), and information sharing (ISh) on CA. However, strategic supplier partnership (SSP), and customer relationship management (CRM) had no impact on CA. However, the study found that BDA does not enhance the impact of SCMPs on CA.

Research, Practical & Social implications: This study provides an inventory of knowledge about the reality of BDA and its moderating role on the relationship between SCMPs and CA, which contributes to enriching the library in overall and Jordanian in specific in this subject.

Originality/value: This paper is one of the first papers in the Jordanian context to address the moderating effect of BDA between SCMPs and CA.

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O IMPACTO DAS PRÁTICAS DE GERENCIAMENTO DA CADEIA DE SUPRIMENTOS NA VANTAGEM COMPETITIVA: O PAPEL MODERADOR DOS GRANDES ANALISTAS DE DADOS

RESUMO

Objetivo: O presente estudo visa investigar o papel moderador da Big Data Analytics (BDA) na relação entre as práticas de gerenciamento da cadeia de fornecimento (SCMPs) e a vantagem competitiva (CA) nas empresas de manufatura jordanianas.

Design/metodologia/abordagem: Método quantitativo foi usado para coletar dados de 156 empresas de manufatura jordanianas. E a regressão linear hierárquica múltipla usando a técnica SPSS foi usada para testar as hipóteses do estudo.

Descobertas: Os resultados mostram um impacto positivo significativo dos SCMPs sobre as CA. Especificamente, um impacto positivo significativo é encontrado entre a qualidade da informação (QI), e o compartilhamento de informação (ISh) sobre CA. Entretanto, a parceria estratégica com fornecedores (SSP) e a gestão de

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relacionamento com o cliente (CRM) não tiveram impacto sobre a CA. Entretanto, o estudo constatou que o BDA não aumenta o impacto dos SCMPs sobre a CA.
Pesquisa, implicações práticas e sociais: Este estudo fornece um inventário de conhecimento sobre a realidade do BDA e seu papel moderador no relacionamento entre SCMPs e CA, o que contribui para enriquecer a biblioteca em geral e a jordaniana em particular neste assunto.
Originalidade/valor: Este trabalho é um dos primeiros trabalhos no contexto jordaniano a abordar o efeito moderador do BDA entre SCMPs e CA.

Palavras-chave: Práticas de Gerenciamento da Cadeia de Suprimentos, Vantagem Competitiva, Grande Analítica de Dados, Empresas de Manufatura, Jordânia.

EL IMPACTO DE LAS PRÁCTICAS DE GESTIÓN DE LA CADENA DE SUMINISTRO EN LA VENTAJA COMPETITIVA: EL PAPEL MODERADOR DE LA ANALÍTICA DE BIG DATA

RESUMEN
Propósito: El presente estudio tiene como objetivo investigar el papel moderador de Big Data Analytics (BDA) en la relación entre las prácticas de gestión de la cadena de suministro (SCMP) y la ventaja competitiva (AC) en las empresas manufactureras jordanas.
Diseño/metodología/enfoque: Se utilizó un método cuantitativo para recopilar datos de 156 empresas manufactureras jordanas. Y para comprobar las hipótesis del estudio se utilizó la regresión lineal múltiple jerárquica mediante la técnica SPSS.
Resultados: Los resultados muestran un impacto positivo significativo de los SCMP en la CA. En concreto, la calidad de la información (IQ) y el intercambio de información (ISh) tienen un efecto positivo y significativo en la CA. Sin embargo, la asociación estratégica con proveedores (SSP) y la gestión de las relaciones con los clientes (CRM) no influyeron en el CA. Sin embargo, el estudio concluyó que la BDA no mejora el impacto de las SCMP en la CA.
Investigación, implicaciones prácticas y sociales: Este estudio proporciona un inventario de conocimientos sobre la realidad de la BDA y su papel moderador en la relación entre las SCMP y la CA, lo que contribuye a enriquecer la biblioteca en general y la jordana en concreto en este tema.
Originalidad/valor: Este trabajo es uno de los primeros en el contexto jordano que aborda el efecto moderador de BDA entre SCMPs y CA.

Palabras clave: Prácticas de Gestión de la Cadena de Suministro, Ventaja competitiva, Big Data Analytics, Empresas Manufactureras, Jordania.

INTRODUCTION

Supply chains are the essence of any organization through its role in connecting suppliers, producers, and end customers in a network of creating and delivering products and services. It is a combination of marking, procurement, warehouse management, and transportation (Awwad et al., 2018). These supply chains need management in form of planning, implementing, and controlling operational activities with the goal of matching supply to demand as effectively and efficiently as possible (Stevenson, 2014). Additionally, it is different approaches used to connect suppliers, manufacturers, warehouses and products efficiently to produce and distribute timely goods and services to the market (Waghmare & Mehta, 2014).

Markets and communities become more technologically oriented, so it just does not pay for any organization to try to do everything itself. This advancement comes with expertise and specialization existing all over the supply chain, adding value at each point (Heizer & Render, 2011). With this added value there is a need to manage organizational philosophy to maintain the technology advancement and globalization by applying IT techniques and big data analytics (BDA).

BDA plays a role in guiding the information flow and development of supply chain processes. It has great role in supply chain management of companies due to the nonstoping development of information technology (Tamym et al., 2020). The extended supply chain network moves beyond particular firm to inter-organizational activities, including suppliers, customers, producers, trading partners, retailers, service providers, and transporters (Naway & Rahmat, 2019). Subsequently, BDA significantly contributes to organizational competitive advantage (CA) regardless of knowledge about its moderating role on the relationship between supply chain management practices (SCMPs) and CA.

At present, Jordanian manufacturers are facing significant challenges in the local and global competition. These challenges have become a reality due to free trade agreements and alliances signed by the Jordanian government, which ended the protection's era of local companies. For instance, the Jordanian membership in the World Trade Organization made the situation more challenging for the Jordanian manufacturers (Nimeh et al., 2018).Although current literature gives a reasonable understanding of the link between SCMPs and CA, there are few studies available on the role of BDA in enhancing the influence of SCMPs on CA.

Moreover, the previous studies focused on studying SCMPs as aggregate construct to examine its impact on CA without giving more attention to examining the effect of each supply chain practice on CA separately than other practices. Furthermore, the role of BDA on the relationship between SCMPs and CA has rarely been investigated in the Middle East and specifically Jordan. Therefore, the current study will answer the question how BDA moderates the relationship between SCMPs and CA in the Jordanian manufacturing firms. The reminder of the current paper is structured as follows: Section two for literature review including Big Data Analytics (BDA), Supply Chain Management Practices (SCMPs) (Strategic Supplier Partnership, Customer Relationship Management, Information Quality and Information Sharing), and Competitive Advantage (CA). Section three represent the research methodology including the study model and the hypothesis development. Section four provides the results. Section five is the discussion. And section six concludes the paper including the conclusion, research implications, and limitations and recommendations for future studies.

LITERATURE REVIEW

Supply Chain Management Practices (SCMPs)

Supply chains or value chains represent adding value by presenting products or services. It is the management process of a whole chain with requirements of special elements from management to meet their strategic targets and manage the chain outside their organizations (Arredondo & Alfaro 2021). Supply chains usually incorporate multiple business organizations, instead of one. They have two dimensions: supply and demand. The supply dimension begins at the beginning of the chain and ends with the internal operational activities of the organization. While the demand dimension starts when the organization's products transported to the customer (Stevenson, 2014). Therefore, the supply chain needs to manage customers demand by ensuring that the products are available in the market where it is required (Iqbal, 2020).

Supply chain management (SCM) is defined as managing and controlling the transformation process of raw resources into valuable products that can create value for the organization (Prajogo et al., 2016). It represents strategic coordination of organization functions within the organization and throughout its supply chain to integrate supply and demand management (Stevenson, 2014). SCM interface between the organization and suppliers, intermediaries and distributors, and costumers (Khaddam et al., 2020). It is a group of approaches that interconnect various suppliers, manufacturers, and warehouses effectively and efficiently, to produce and distribute products in the right quantity and time to control and reduce costs and achieve a better level of service (Azevedo & Reis, 2019).Coordinating the activities within the supply chain maximize the competitive advantage and benefits to the ultimate customer (Heizer & Render, 2011).

Supply chain management practices (SCMPs) are operational functions of organizations that identify the effectiveness and efficiency of its supply chain (Sandhu et al., 2013). They are defined as “the set of activities undertaken by an organization to promote effective management of its supply chain” (Chileshe & Phiri 2022, p.592).

Various measurements used for SCMPs in literature for instance, Li et al. (2005) developed and validated six dimensions measure including strategic supplier partnership, customer relationship, information sharing, information quality, postponement, and internal lean practices. Another measurement was developed by Kumar et al. (2019). It consists of information quality, information sharing, and supplier relationship. However, Sandhu et al. (2013) excludes internal lean practices from Li et al. (2005).

Based on the above, the current study chooses strategic supplier partnership (SSP), customer relationship management (CRM), information sharing (ISh), and information quality (IQ) as the main dimensions of SCMPs.

Strategic supplier partnership represents a long-term relationship between the organization and its suppliers (Koh et al., 2007)**.** It focuses on the direct, long-term association, mutual planning, and problem-solving efforts (Agus & Hassan, 2008). The success and failure of the supply chain network depend on the relationship and coordination between customer and supplier. It is important to develop strong relationships with suppliers because most of the upstream supply chains depend on outsourcing and procurement of raw materials (van den Brink, 2019; Chen et al., 2019; Kembro et al., 2017). To meet organizational goals, there is a need to develop the operational, strategic efforts, and capabilities of the participating organizations by utilizing SSP (Li et al., 2005).

Customer relationship management indicates the processes and activities the organization uses to emphasize and manage close and long-term relationships with customers.It refers to sharing of information about the product with customers and associating with them to manage and satisfy their demand, accepting their orders, having an order placing system, sharing order status with them during order scheduling, and delivery the product to them(Lee et al., 2007). It is also a way of obtaining information about products, market needs, inventory, and operational processes from organizations' customers (Mentzer et al., 2006). In addition to its role in handling complaint, developing the long-term relationship with customers, and following customer satisfaction (Koh et al., 2007)**.**

Information Quality encompasses different dimensions including timeliness, adequacy, accuracy ,and credibility of shared information (Li et al., 2006). The quality of the shared information is essential for achieving effective supply chain management (Li & Lin, 2006). Better coordination within the supply chain can be achieved through ensuring high quality exchange of the information leading to smooth and enhanced performance (Vosooghidizaji et al., 2019; Marinagi et al., 2015).

Information sharing is "the extent to which critical and proprietary information is communicated to one's supply chain partner"(Li & Lin, 2006).It is also the transformation of information with quality between supply chain members (Koh et al., 2007). ISh plays critical role in improving organizational performance. In the manufacturing organizations, information sharing reduces cost and inventory, increase visibility, and improve internal service and resource utilization leading to achieve the desired efficiency (Shamout & Elayan, 2018; Lotfi et al., 2013).

Competitive Advantage (CA)

Competitive advantage (CA) refers to the level where a company can build a safe status on its competitors. It consists of qualifications that allow a company to separate itself from its rivals and a result of complex management decisions (Kankaew et al., 2021). It's the creation of a system that has a unique advantage over competitors (Heizer & Render, 2011) which offers organization capabilities that allow differentiating itself from its competitors. This competition includes business's main entrants, design and product's growth relation, and upgrading of the organization's position (Vargas et al., 2018). It can be obtained by offering unique services or products for specific segments with minimum price (Sadalia, Muharam, & Mulyana, 2021).

Quality, delivery, and flexibility among others were identified as important competitive capabilities for organizations (Li et al., 2006). In addition to product innovation and time market. Quality attracts customers' attention towards a specific product and encourages them to use it frequently (Iqbal, 2020). It focuses on competing others by producing products that meet or exceed customers' expectations (Yan Jin et al., 2014). This helps the organization to achieve a competitive advantage by acquiring a substantial market share and dominating in the market based on quality excellence (Singh, 2013). For instance, good quality helps attaining CA in cost, flexibility, distribution, and others leading to less scraps and reworks (Phan et al., 2011). Delivery dependability concerns competing by delivering the right product at the right time (Yan Jin et al., 2014). It is the organization capability the type and amount of products on time (Li et al., 2006). Product innovation is defined as the organization's ability to develop and improve its manufacturing activities for existing products and develop and increase these activities to produce new ones (Khaddam et al., 2020). For instance, it is producing innovative products by capturing competitive advantage using existing resources (Saleem et al., 2020). Time to market is the organization capability to introduce new products faster than key competitors (Li et al., 2006). For instance, utilizing the organizations' superior resources and capabilities effectively will help to create a competitive advantage (Agha et al., 2012). However, organizations may fail if they neglect the success factors in the supply chain including high quality, flexibility, and quick response (Wu et al., 2014).

Big Data Analytics (BDA)

Big data has acquired importance amongst firms because of its benefits and potential of generating strategic values for organizations (Saleem et al., 2020). The term Big Data refers to the development and use of technologies that provide the right information from a mass of data to the right user at the right time (Riahi & Riahi, 2018).

Big data has factors including volume, velocity, and variety; 3Vs. Volume represents the size of current datasets, velocity is the rate of data collection, and variety concerns generating unstructured data by different sources (Laney, 2001). It encompasses large amounts of structured and unstructured data that is available and accessible in real-time but is complex and hard to manage (Inamdar et al., 2020; Provost and Fawcett, 2013). Managing this data occur by Big data analytics (BDA) which is a method that processes and analyzes the above mentioned 3Vs to create results that leads to competitive advantage (Garmaki et al., 2016), among the market and helps facilitating decision making (Tsai et al., 2015).

Subsequently, BDA is the process of collecting, organizing, analysing large sets of data and producing patterns and the techniques that discover hidden values from large and complex datasets that help the organization effectively solve different problems (Verma et al., 2016). Therefore, BDA may help organizations to better understand their customers' needs and provide them with better services (Darvazeh et al., 2020)**.**

RESEARCH METHODOLOGY

Population and research sample

The population of the current research consists of the Jordanian manufacturing firms which are basically located in the Jordanian Industrial Estates. There are nine industrial estates around Jordan, however, the researchers chose to focus only on two of them, the Abdullah II Ibn AL-Hussein Industrial Estate and AL-Hassan Industrial Estate. The choice of these two estates was based on their position between the others. For instance, Abdullah II Ibn AL-Hussein Industrial Estate in Sahab City, was established in 1984 and it is considered as the largest industrial estate in Jordan, while AL-Hassan Industrial Estate in Irbid Governorate, was established in1991 and is the largest Qualified Industrial Zone (QIZ) in Jordan.

Questionnaires were distributed to all manufacturing firms in the above-mentioned industrial estates, 159 questionnaires were retrieved and two of them were excluded leaving 156 valid questionnaires.

Study instrument

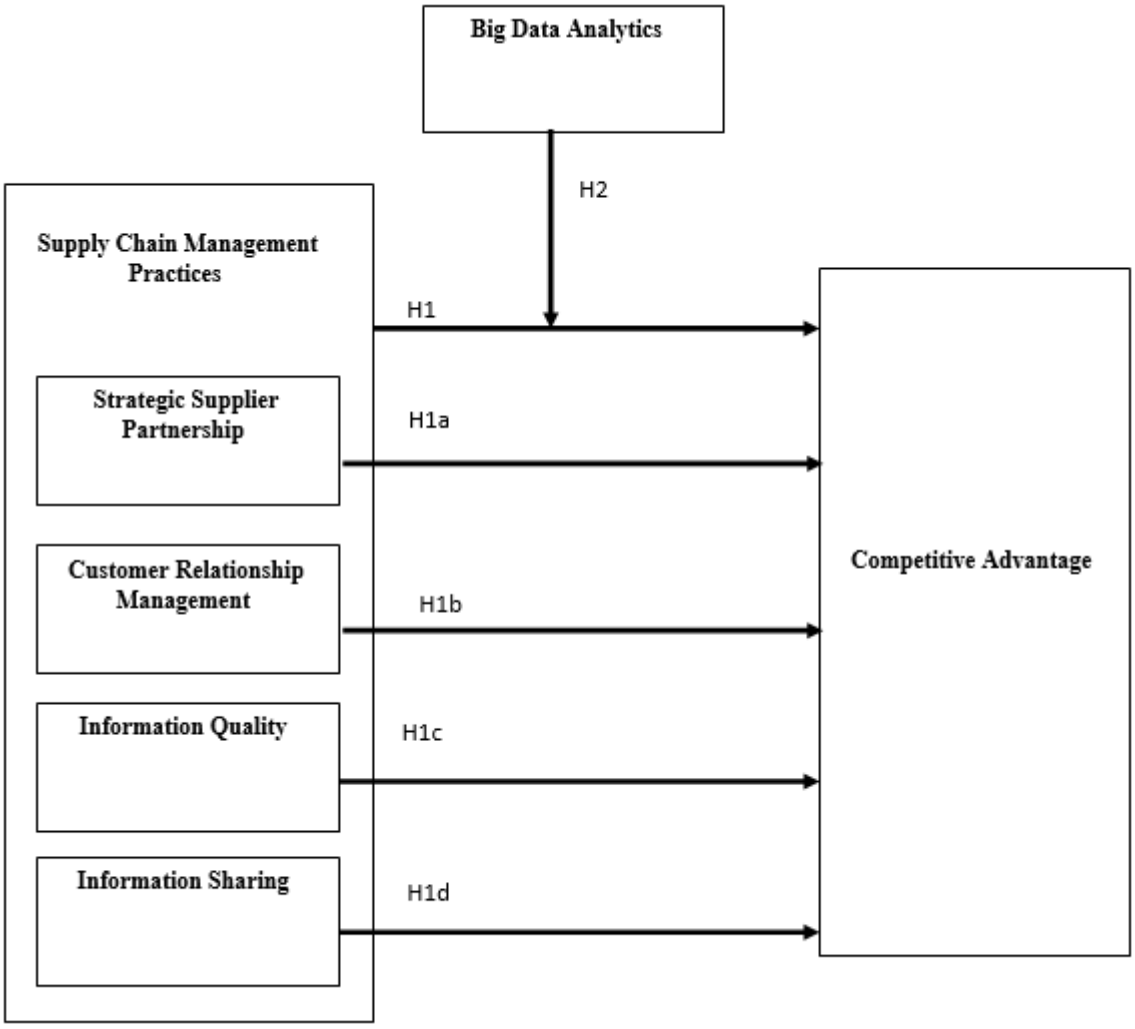
A questionnaire based on the literature of the research was developed as the study instrument. The questionnaire consists of two topics, the first one includes demographic questions, and the second one was for the variables related questions of SCMPs including SSP, CRM, IQ, ISh, CA and BDA. The questionnaire items were formulated in 37 statements divided

into 6 items for SSP, 4 items for CRM, 5 items for IQ, 5 items for ISh, 12 items for CA and 5 items for BDA.

Study model

The research model was built based on reviewing the literature of supply chain management practices and its relationship with Competitive advantage. It also shows the moderating effect of big data analytics on the relationship between the independent (SCMPs) and dependent variable (CA) as it was illustrated in the research problem. Figure 1 below illustrates the research model.

Figure1: Research Model



Source: Prepared by the researchers.

Hypotheses development

The effective supply chain was proved to help organizations to obtain competitive advantage through managing the changing demands, offering flexibility to decrease the cost, and improving the quality of the products (Iqbal, 2021). A recent study in Kenya's dairy supply chain shows that SCMPs has significant positive effect on CA (Kankaew et al., 2021). SCMP scan enhance organizations flexibility and ability to adapt to environmental changes (Koh et al., 2007). Hence, the first hypothesis is:

H1: There is a positive significant statistical impact of SCMPs on CA.

Furthermore, supply chain improves the collaboration between the suppliers and helps in creating durable competitive edge (Golicic & Smith, 2013). Hence, the first subordinate hypothesis is:

H1a: There is a positive significant statistical impact of SSP on CA.

For the relationship with suppliers and customers, building long term partnership helps to improve the flexibility of the supply chain through making mutual understanding between them (Chang et al., 2005). Organizations also should involve customers and suppliers to improve quality performance, reduce cost, and achieve customer satisfaction (Phan et al., 2011). Hence, the second subordinate hypothesis is:

H1b: There is a positive significant statistical impact of CRM on CA.

Technology and the quality of the shared information have influenced the organization performance and allow them to gain competitive advantage (Guesalaga et al., 2018). Information quality gives organizational managers the visibility to lead and to make decision-making process easier (Khare, 2006). Finally, information sharing serves the integration of supply chain through enhancing the responsiveness of the manufacturing firms to customers changing needs (Li & Lin, 2006), and coordination with the suppliers (Tarafdar & Qrunfleh, 2017). Hence, the third and fourth subordinate hypotheses are:

H1c: There is a positive significant statistical impact of IQ on CA.

H1d: There is a positive significant statistical impact of ISh on CA.

The moderating role of BDA

Organizations nowadays use advanced technologies including data analytics to improve productivity, sales, delivery, and gaining competitive advantage (Darvazeh et al., 2020). For instance, technology enhances and facilitates supply chain planning by providing prompt information regarding production basics such as inventory and delivery (Chen & Paulraj, 2004). BDA become important for organizations through its role in providing better data accuracy and

clarity across the supply chain, driving supply chains ahead (Darvazeh et al., 2020). BDA allows organizations to capture, process, analyze, store, and exchange data about their operations (Oncioiu et al., 2019). These data are valuable and generate insights that helps to achieve competitive advantage (Rowe & Pournader, 2017).

Consequently, organizations utilize big data to stay innovative and competitive in changing markets (Saleem et al., 2020; Heisterberg & Verma, 2014; Kamioka & Tapanainen, 2014). In addition BDA plays an important role in making significant contributions to product development, demand prediction, supply decisions, distribution optimization, and customer feedback (Oncioiu et al., 2019).

Based on the above discussion, using BDA enhances the integration of supply chain practices and lead to competitive advantage. Therefore, this paper investigates the role of BDA on the relationship between SCMPs and CA in the Jordanian manufacturing firms. Hence, the second hypothesis is:

H2: BDA enhances the impact of SCMPs on CA.

RESULTS

Descriptive statistics

Table 1 below shows frequencies for respondent's demographics. Of 156, 132 (84.6%) were males and 24 (15.4%) were females, showing that majority of surveyed respondents were males. Concerning age of respondents, that sample included respondents from all targeted ages as follows: less than 30 years 51 (32.7%), 31 – 39 years 57 (36.5%), 40 – 49 years 24 (15.4%) and 50 years or more 24 (15.4%). Respondents have high levels of education as most reported education level was bachelor 98 (62.8%), PH. D or master were 15 (9.6%), diploma holders were 23 (14.7%) and those with low education level -secondary or less- were 20 (12.8%). Finally, the sample included respondents from all targeted titles that were seen relevant to current study topic: Factory manager/general manager 13 (8.3%), Industrial Engineer 42 (26.9%), Production Manager 21 (13.5%), IT manager/ computer engineer 36 (23.1%), Manager quality assurance/ SCM manager 33 (21.2%) and Others 11 (7.1%).

Table 1 Respondent's demographics

Category	Group/ Sub-Group	n	%
Gender	Male	132	84.6%
	Female	24	15.4%
	Total	156	100%
Age	Less than 30 years	51	32.7%
	31 – 39 years	57	36.5%
	40 – 49 years	24	15.4%

	50 years or more	24	15.4%
	Total	156	100%
Education	Secondary or less	20	12.8%
	Diploma	23	14.7%
	Bachelor	98	62.8%
	PH. D or master	15	9.6%
	Total	156	100%
Job	Factory manager/general manager	13	8.3%
	Industrial Engineer	42	26.9%
	Production Manager	21	13.5%
	IT manager/ computer engineer	36	23.1%
	Manager quality assurance/ SCM manager	33	21.2%
	Other	11	7.1%
	Total	156	100%

Source: Field Data

Firms' demographics are displayed in Table 2, regarding organizations age those respondents work for, 4 (2.6%) of respondents works for firms that aged less than 5 years, 12 (7.7%) of respondents works for firms that aged 5 – 10 years, 53 (34%) of respondents works for firms that aged 11 – 15 years and 86 (55.5%) of respondents works for firms that aged more than 15 years. For organization size, the sample included respondents works in small, medium and large firms: 6 (3.8%) of respondents works for firms that have less than 50 employees, 5 (3.2%) of respondents works for firms that have 51 – 99 employees, 37 (23.7%) of respondents works for firms that have 100 – 250 employees and 95 (60.9%) of respondents works for firms that have more than 250 employees. Finally, Table 3 shows the answers for the open question asking respondent to state Big data systems used in their firm, responses reported the following: Alfa system (40), ERP (37), Oracle (22), Map redne (6) and Alta (5).

Table 2 Firms' demographics

Category	**Group/ Sub-Group**	**n**	**%**
Organization age	Less than 5 years	4	2.6%
	5 – 10 years	12	7.7%
	11 – 15 years	53	34%
	More than 15 years	86	55.5%
	Missing	1	0.6%
	Total	156	100%
Organization size	Less than 50 employees	6	3.8%
	51 – 99 employees	5	3.2%
	100 – 250 employees	37	23.7%
	More than 250 employees	95	60.9%
	Missing	13	8.3%
	Total	156	100%
	No	42	26.9%
	Missing	3	1.9%
	Total	156	100%

Source: Field Data

Table 3 Big data applications

Application	Count
Alfa system	40
ERP	37
Oracle	22
Map redne	6
Alta	5

Source: Field Data

Data analysis

SPSS v.26 was used for data analysis. The analysis made use of descriptive statistics and hierarchical multiple linear regression to examine the moderation role of BDA on the association between SCMPs and CA. Hierarchical multiple regression was found to be the most appropriate approach for the current study because it determines whether the variables explain a satisfactory amount of variation in the dependent variable and at the same time accounting for all other variables (Gelman & Hill, 2006).

Measurement assessment

Statistical reliability for scales was measured through Cronbach alpha values. A Cronbach alpha greater than 0.60 and in more recent standards greater than 0.70 supports the reliability of scale (Sekaran & Bougie, 2016). Cronbach alpha values were greater than 0.70 for all variables scales except for SSP, however, it is in the acceptable range. Table 4 shows Cronbach alpha values.

Table 4 Reliability test

Variable	Items	Cronbach Alpha
SSP	6	0.644
CRM	4	0.720
IQ	5	0.722
ISh	5	0.792
SCMPs	20	0.778
CA	12	0.786
BDA	5	0.813

Source: Field Data

For internal consistency, Pearson correlations between each statement and its factor was measured. All statements correlated to its suggested factor significantly at (0.01) level, all correlations were greater than (***r*** = 0.20) level showing adequate internal consistency. Table 5 below shows internal consistency results.

Table 5 Internal consistency

Factor	Statement	*r*	Factor	Statement	*r*
SSP	SSR1	0.482**	CA	CA1	0.454**
	SSR2	0.686**		CA2	0.525**
	SSR3	0.560**		CA3	0.603**
	SSR4	0.720**		CA4	0.711**
	SSR5	0.655**		CA5	0.642**
	SSR6	0.499**		CA6	0.574**
CRM	CRM1	0.582**		CA7	0.520**
	CRM2	0.779**		CA8	0.464**
	CRM3	0.835**		CA9	0.520**
	CRM4	0.736**		CA10	0.531**
IQ	IQ1	0.566**		CA11	0.519**
	IQ2	0.708**		CA12	0.506**
	IQ3	0.752**	BDA	BDA1	0.555**
	IQ4	0.735**		BDA2	0.723**
	IQ5	0.673**		BDA3	0.834**
ISh	IS1	0.623**		BDA4	0.846**
	IS2	0.806**		BDA5	0.794**
	IS3	0.805**			
	IS4	0.779**		//	
	IS5	0.704**			

** Correlation is significant at the (0.01) level
Source: Field Data

Normal distribution and multi-collinearity

Normality and multicollinearity tests are recognized as important assumptions to use multiple regression analysis. The collected data were found free of normality issues as kurtosis and skewness which measures data symmetry was found as suggested falling in the range of ± 2.2 in accordance with Sposito et al. (1983), suggesting that parametric analysis is valid to use. Results are displayed in Table 6.

Table 6 The normal distribution of the data

Variable	Kurtosis	Skewness
SSR	-1.107	1.717
CRM	-1.246	2.058
IQ	-1.313	1.709
IS	-1.206	1.744
SCMP	-0.766	0.665
CA	-0.949	0.742
BDA	-0.207	-0.797

Source: Field Data

Possibility of multicollinearity issue among SCMPs dimensions were also examined through Variance Inflation Factor (VIF) values that should be below (10), and Tolerances that should be greater than (0.1) and Pearson correlations that should be below threshold of (*r*= 0.90) (Kline, 2015; Pallant, 2020). Findings in Table 7 demonstrated that SMCPs was free of

multicollinearity issue as maximum VIF value was (1.126), and minimum Tolerance value was (0.888), further, Pearson correlations were also seen low far below threshold of (*r*= 90).

Table 7 Tolerance, VIF and Pearson correlations

			Pearson correlations			
Variable	**Tolerance**	**VIF**	1	2	3	4
SSP	0.908	1.101	1			
CRM	0.888	1.126	0.280**	1		
IQ	0.933	1.072	0.177*	0.231**	1	
ISh	0.944	1.059	0.218**	-0.026	0.351**	1

* Correlation is significant at the (0.05) level
** Correlation is significant at the (0.01) level
Source: Field Data

Finally, to check for bias issue, Harman's single factor test was examined, the single solution reported poor fit, the test scored (16.181%) demonstrating that the first identified factor explained only 16.181% of variation, which is below 50% supporting suggestions of (Podsakoff et al., 2012).

Hypotheses testing

The research hypotheses were tested using hierarchical multiple linear regression to examine the impact of SCMPs on CA and if BDA enhances this impact. For instance, two regression models were conducted. In these models, demographics were entered in first block to control for its influence. Table 8 below displays the results of the hierarchical multiple regression analyses for the impact of SCMPs dimensions on CA to test the first main hypothesis and the subordinate ones.

Table 8 Hierarchical multiple regression (SCMPs impact on CA)

n= 156		***β coefficient***	
Variable		Model 1	Model 2
Intercept		3.516 (0.000)*	1.534 (0.014)*
Control variables	Gender	-0.074 (0.379)	-0.003 (0.966)
	Age	0.057 (0.509)	0.054 (0.486)
	Education	0.058 (0.523)	0.066 (0.414)
	Job	-0.039 (0.679)	-0.005 (0.951)
	Organization age	0.249 (0.028)*	0.248 (0.015)*
	Organization size	0.057 (0.611)	0.002 (0.987)
	SSP		0.014 (0.859)

Independent variables	CRM		0.003 (0.970)
	IQ		0.210 (0.012)*
	ISh		0.339 (0.000)*
	R^2	0.105	0.311
	Adjusted R^2	0.065	0.259
	F	2.635 (0.019)*	5.924 (0.000)*
	ΔR^2	--	0.207
	F for ΔR^2	--	9.824

* Influence is significant at the (0.05) level
Source: Field Data

Model 1 entered control variables and reported. The total model was significant (F = 2.635, *P* = 0.019), amount of variation scored R^2= 6.5%, entailing that control variables explained 6.5% of variation in CA.

Model 2 entered independent variables into the model, the model was significant as F calculate scored (F = 5.924, P = 0.000). The explained variance increased scoring (R^2 = 25.9%), entailing that control variables and SCMPs dimensions explained acceptable levels of variation in CA. Regarding the influence of each dimension, both SSP and CRM were found non-significant predictors for CA as beta coefficients scored (β = 0.014, *P* = 0.859) for SSP and scored (β = 0.003, *P* = 0.970) for CRM suggesting no support for H1a and H1b.

Meanwhile, IQ and ISh were found significant predictors for CA, beta coefficients scored (β = 0.210, *P* = 0.012) for IQ and scored (β = 0.339, *P* = 0.000) for ISh providing support for H1c and H1d respectively. In fact , ISh was the strongest predictor of CA.

As SCMPs are interrelated systems/ practices, examining overall influence can provide more precise results, therefore table 9 examined the influence of SCMPs overall on CA, further moderation mechanism was also examined to test remaining hypotheses.

Table 9 Hierarchical multiple regression analyses of SCMP, BDA and moderation on CA

n= 156		***β coefficient***			
Variable		Model 1	Model 2	Model 3	Model 4
Intercept		3.516 (0.000)*	1.234 (0.043)*	1.112 (.071)	1.203 (0.056)
Control variables	Gender	-0.074 (0.379)	-0.026 (0.737)	-0.032 (0.685)	-0.030 (0.706)
	Age	0.057 (0.509)	0.097 (0.224)	0.107 (0.179)	0.102 (0.204)
	Education	0.058 (0.523)	0.044 (0.601)	0.020 (0.814)	0.008 (0.927)
	Job	-0.039 (0.679)	0.001 (0.995)	0.027 (0.763)	0.018 (0.844)
	Organization age	0.249 (0.028)*	0.257 (0.014)*	0.236 (0.026)*	0.240 (0.024)*

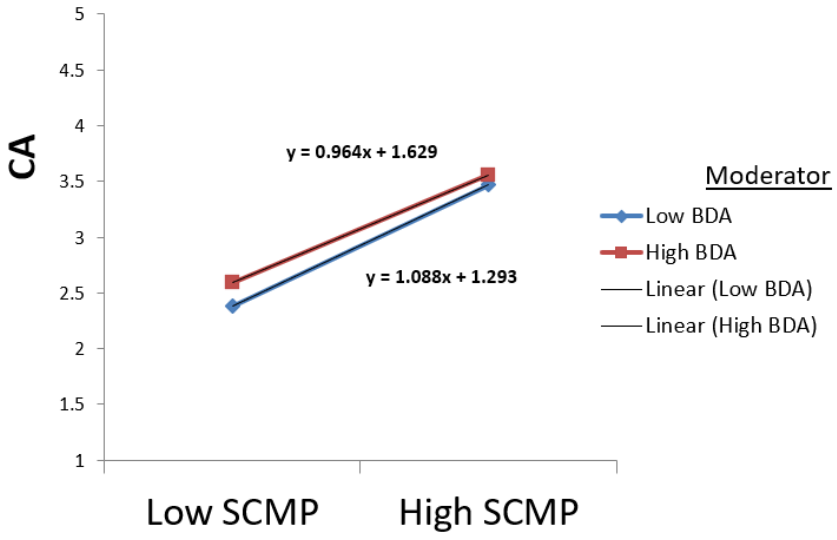
	Organization size	0.057 (0.611)	0.010 (0.924)	0.003 (0.975)	-0.001 (0.994)
Independent variable	SCMP		0.380 (0.000)*	0.360 (0.000)*	0.352 (0.000)*
Moderator	BDA			0.111 (0.214)	0.114 (0.203)
Interaction effect	SCMP × BDA				-0.057 (0.466)
	R^2	0.105	0.241	0.250	0.253
	Adjusted R^2	0.065	0.201	0.205	0.202
	F	2.635 (0.019)*	6.076 (0.000)*	5.534 (0.000)*	4.962 (0.000)*
	ΔR^2	--	0.136	0.009	0.003
	F for ΔR^2	--	24.024	1.562	0.535

* Influence is significant at the (0.05) level
Source: Field Data

Referring to results in Table 9, Model 1 entered control variables and reported the total model was significant (F = 2.635, *P* = 0.019), amount of variation scored R^2= 6.5%, entailing that control variables explained 6.5% of variation in CA.

Model 2 entered independent variable SCMPs into the model, the model was significant as F calculate scored (F = 6.076, P = 0.000). The explained variance increased scoring (R^2 = 20.1%), entailing that control variables and SCMP explained acceptable levels of variation in CA. SCMPs was found a significant predictor for CA, Beta coefficient scored (β = 0.380, *P* = 0.000) providing support for H1. Model 4 introduced the interaction term which is the moderation influence: SCMP × BDA to the model, the interaction term failed to achieve significant impact as beta coefficient scored (β = -0.057, *P* = 0. 466) rendering no support for H2. Figure 2 below depicts the moderation impact of BDA over SCMPs and CA association.

Figure 2 Moderation impact of BDA over SCMPs and CA association



Source: Field Data

DISCUSSION OF THE RESULTS

The current study investigates the moderating role of BDA on the relationship between SCMPs and CA in the Jordanian manufacturing firms. The findings of this study show that SCMPs is a significant predictor for CA, providing support for H1, which is supported by (Kankaew et al., 2021) and (Koh et al., 2007). Kankaew et al. (2021) study shows that that SCMPs has significant positive effect on CA in Kenya's dairy supply chain, while Koh et al. (2007) shows that SCMP scan enhance organizations flexibility and ability to adapt to environmental changes.

Furthermore, the study shows that both SSP and CRM are non-significant predictors for CA suggesting no support for H1a and H1b. This result is against (Golicic & Smith, 2013) and (Chang et al., 2005). Golicic & Smith (2013) found that supply chain improves the collaboration between the suppliers and helps in creating durable competitive edge, while Chang et al. (2005) advice building long term partnership helps to improve the flexibility of the supply chain through making mutual understanding between them.

Moreover, IQ and ISh were found significant predictors for CA, providing support for H1c and H1d respectively. In fact, ISh was the strongest predictor of CA. This result is in consistence with the findings of Guesalaga et al. (2018) who found that technology and the quality of the shared information have influenced the organization performance and allow them to gain competitive advantage. In addition to its role in giving organizational managers the visibility to lead and to make decision-making process easier (Khare, 2006).

However, there was no support for H2 representing the moderation impact of BDA over SCMPs and CA association. This result could be due to the lack of using BDA in the Jordanian manufacturing firms which is limited to few applications.

Earlier findings provided critical indicators that managers and those in charge of the Jordanian manufacturing firms should consider, as SSP and CRM were found non-significant predictors, this does not underestimate the value and role of SSP neither CRM, in fact this entails that these systems are not efficiently aligned with firms' operations so that were not able to trigger CA, managers should consider investigating issues with SSP and CRM to become effective predictors for the firm's CA.

CONCLUSION

This paper investigates the impact of SCMPs on CA in the Jordanian g manufacturing firms and the moderating impact of BDA on this relationship. The findings support H1c and H1d concerning a positive significant impact from IQ and ISh respectively on CA, where ISh

was the strongest predictor of CA. However, the hypotheses concerning SSP (H1a) and CRM (H1b) were not supported. In addition, the findings support H1 suggesting a positive impact from SCMPs on CA while there was no support for the moderating impact of BDA on this relationship.

The research findings detected a defect in surveyed firms concerning BDA, in fact, buying BDA systems cannot guarantee expected outcome for firms unless managers inline it with remaining systems and capabilities in firm. Findings demonstrate that managers should reconsider BDA in their firms, otherwise their investment in such expensive technology would be a waste of their financial resources.

RESEARCH IMPLICATIONS

The application of big data analytics by companies in supply chains helps in understanding customers needs and sales trends which guides them through production, inventory, prices, and other related strategic plans. These plans could include different parties in the supply chain and could help and affects the competitive edges that these companies have among other companies.

It is also evident through the above-mentioned literature that supply chain management practices involving suppliers and customers affect performance which reflects on gaining competitive advantage. Therefore, applying BDA techniques could help companies in controlling their operations and for example, order based on the sales trends that presented on the results of the BDA reports to cut wasting products and inventory.

Nevertheless, the current study found that BDA do not enhance the impact of SCMPs on CA in the Jordanian manufacturing firms and this result could be due to the lack of understanding and good implementation of the SCM practices or the issues in using BDA techniques or data collection methods that will result in not real reports about the markets and no enhancement of the performance.

LIMITATIONS AND RECOMMENDATIONS FOR FUTURE STUDIES

The current study considers the Jordanian manufacturing firms, future studies may consider different sector that may further utilize big data analytics techniques. Another limitation is the use of only four practices of supply chain management, while there are different instruments that used more than these specific practices. Finally, further studies may consider the moderating effect of BDA on performance rather than competitive advantage.

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