

TOWARD DIGITALIZATION ERA IN SUPPLY CHAIN: A MEDIATION MODEL OF SUCCESS DRIVERS

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ABSTRACT

This study analysed the key success drivers for digital supply chain adoption, including technical skills, government support, services availability, and service cost. Upon extending the vast literature, this present study assessed the mediation role of trust and customer willingness for the relationship between key success drivers and digital supply chain success. Digital supply chain refers to the adoption of technical tools and applications with smart information systems to facilitate supply chain procedures and functions. The study data were gathered from 259 customers sampled across varying regions in Jordan. The partial least squares structural equation modelling (PLS-SEM) was deployed to test the research hypotheses and the conceptual model. As a result, all the drivers (technical skills, government support, & services availability) displayed a direct impact on customers' trust and willingness to adopt digital supply chain. Trust and customer willingness mediated the relationship between all three drivers and digital supply chain success.

Keywords: Digitalization, Supply Chain, Drivers, Trust, Customer Willingness.

INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) has spread across the globe and hindered the ability of multiple companies from developing effective response mechanisms. The COVID-19 has adversely affected human lives, economic activities, industrial processes, and all business types (Dolgui et al., 2020; Golan et al., 2020; Ivanov & Dolgui, 2020). Many affected regions are located at the centre of the global trade and manufacturing supply chain networks. This has affected the availability of goods and services, as numerous companies need to build strategic inventories to meet demands fluctuations during the pandemic (Mollenkopf et al., 2020; Alhawamdeh & Alsmairat, 2019).

Therefore, exploring how global suppliers and manufacturers handle different operations may facilitate all businesses to structure their responses. It is crucial for companies to re-think how they can ensure supply chain flexibility in emergency situations. In fact, many studies have proposed effective approaches that resolve supply chain challenges during the COVID-19 pandemic. For example, Gupta et al., (2016) highlighted the importance of disaster relief management, while Hohenstein et al., (2015) prescribed that companies should develop better understanding of risk management and resiliency issues in their supply chain to develop effective mitigation actions. Other studies reckoned the integral roles of enhanced processes, transformative services, innovation, technology, and social media channels during the pandemic (see Ostrom et al., 2015; Aljuraid & Alsmairat, 2021). Kelly and Marchese (2015) asserted that the dynamic, complex, and flexible supply chain should be integrated with information technology (IT), so as to enhance its role in value chain creation. Another reason for investigating supply chains during pandemic is the effect of lockdown on social interactions and economic activities as people are restricted from buying and selling as usual. As such, there is a pressing need to assess how the integration of technology, innovation, and supply chain can ascertain supply continuity (services & goods), particularly in overcoming restrictions that come with lockdown. Therefore, this study critically examined a set of digital supply chain success drivers by considering the mediation role of trust and customer willingness. Digital services are

an interventional mechanism for effective provision of goods and services to customers during lockdown. It is also an approach that describes the ability of supply chains to provide, supply, and distribute goods to customers effectively using electronic commerce (e-commerce) platforms and other smart technologies (Araz et al., 2020; Ivanov, 2020; Mollenkopf et al., 2020). The aspects and drivers of digital supply chain assessed in this study are technical skills, government support, services availability, and services cost within the context of Jordan. In fact, only a handful of studies had looked into digital supply chain during the pandemic. The remaining of this paper is organised as follows: the literature review and hypotheses development are presented in the next section. Next, the methodology and analysis are described. Finally, the outcomes are discussed and several recommendations are listed for future endeavour.

LITERATURE REVIEW

The widespread of COVID-19, combined with the rapidly increasing business pressure from customers, government, and the society, has led to the need for a new era of supply chain with technological revolution characterised by wide, quick growth, and spread of logistics services in a different way – unfolding increased challenges and responsibilities for companies. The conventional supply chain denotes a network of facilities, responsibilities, and alternatives that enable material processing that converts materials to semi-processed materials (intermediate), finished products, and distribution of the products to end-consumers (Alsmairat & Saydam, 2015). Recently, the increasing importance of e-commerce has opened a new dimension in light of production, sales, and purchase awareness. Apart from seeking goods and services, consumers look forward for advanced IT systems, production flexibility, and automated manufacturing operations. Ageron et al., (2020) asserted that digitalisation has heavily affected a number of aspects in this technological realm. This notion is characterised by a competitive, dynamic, and intricate business setting. They added that organisations should benefit from the massive number of internet users actively indulge in online purchases.

The combination between digital technologies and supply chain process is called digital supply chain (Capgemini, 2016; Majeed & Rupasinghe, 2017; Mollenkopf et al., 2020; Preindl et al., 2020). Ageron et al., (2020) defined digital supply chain as adopting innovative technologies and reliance on IT systems to provide all supply chain and logistics activities the continuity of providing services and products, thus enhancing customer service and sustainable performance of the organisation. Agrawal and Narain (2018) depicted that digitalization is not a choice, but imperative for all businesses across all industries through production, distribution, transportation, and logistics activities. Such a transformative process has facilitated many companies to embrace vast alterations in marketing, production, and logistics. Satisfied consumers would be quick to respond to such progress in business setting, especially during pandemic, by the speed in the receiving, processing, and delivering orders based on the demands of consumers. Lopes de Sousa Jabbour et al., (2020) depicted that effective management of digital supply chain process could benefit from the exponential growth in e-commerce and the growing number of users. Subsequently, the efficiency of logistics, order fulfilment, information flow, and customer service management can be enhanced. As advanced IT systems are essential to suppliers, manufacturers, distributors, and retailers; different skills, more flexibility, creative strategies, and better agility are required (Gupta et al., 2016). Organisations must also comprehend factors and drivers that determine success during uncertain situations. Therefore, it is crucial to examine factors that drive the adoption of digital supply chain from the customers' perspective to create a new integrated paradigm of digitalisation. Upon doing so, customers can enjoy a transformed supply chain and increase their trust to use it. The main driver of digital supply chain is technical skills, which refer to the knowledge and information a customer should have to apply e-commerce platforms (Hennig-Thurau, 2004). Al-adaileh et al., (2016) highlighted the significant differences among customers applying technologies based on

education level, age, as well as knowledge based on their daily lives/business. Technical skills have a direct effect on customer willingness to adopt new innovation and digital services. Technical skills are the basic requirements for digital services and a critical concept for successful application usage (Perla et al., 2018). Simply put, technical skills are a basic desirable property of a transformative supply chain. Therefore, the first hypothesis formulated in this study is as follows:

H1: Technical skills have a statistical significant impact on customer's willingness and trust to adopt digital supply chain.

Digitalisation in supply chain network revolves around offering support to attain greater social responsibility and more benefits. Government support is a crucial factor that denotes the government at all levels as they have the responsibility to aid business undertakings by restructuring bureaucratic procedures (Kim & Chai, 2017). Samdantsoodol et al., (2017) claimed that it is the responsibility of the government to provide infrastructure that enables smooth flow of raw materials and end-products. This is because; infrastructure made available in a certain area is a source of agility and has the potential to boost the financial performance of a firm (Avelar-Sosa et al., 2018). The role of government in supply chain is not limited to that, for instance, the logistics of raw materials and end-products requires transportation, whereby emission of pollutants should be regulated by the government (Shu et al., 2017). Digital supply chain success is driven by government support, which in turn, motivates customers to trust and be willing to adopt new innovation and technologies. Therefore, the role of the government is fundamental in supporting the adoption of supply chain management technologies, especially in the geographical contexts of Jordan. Therefore, the study proposes the following:

H2: Government support has a statistical significant impact on customer's willingness and trust to adopt digital supply chain.

Lim & Thiran (2010) defined service availability as the probability that e-services, applications, and techniques are in functioning condition for all customers anywhere and anytime. Kryvinska & Strauss (2013) asserted that the availability of e-service and applications can be selected or even substituted by others when one fails. This can sustain not only the high availability but also guarantees the quality of the services expected by users. Ivanov & Dolgui (2020) stated that the availability of these services to all customers anywhere is essential to enhance their trust level. Likewise, the value of digital supply chain has become indisputably evident during the COVID-19 pandemic as many firms have adapted their supply-demand allocations rapidly. As such, the following is proposed:

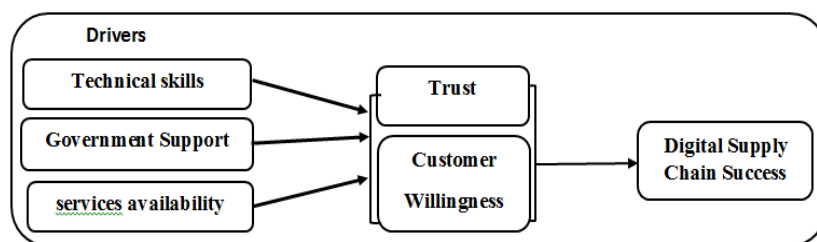
H3: Services availability has a statistical significant impact on customer's willingness and trust to adopt digital supply chain.

Rousseau (1998) defined trust as one's confidence or expectation about the other party, or as a behavioural intention or willingness to depend or rely on another party, coupled with a sense of vulnerability or risk if the trust is violated. In light of digitalisation, trust is a factor that influences online services based on a buyer's expectations of how the new technology and innovation may deliver opportunities (Bart et al., 2005). Wayne & Megan (2002) claimed that trust has a critical role in all customer decision process and phases. It is also a dynamic construct that can affect a customer's behaviour to adopt any new service, product or technique. The degree of trust in information sharing and exchanging portal may influence the success of digital supply chain, besides affecting a customer's willingness towards adoption. According to Salam (2017), trust has a significant role in adaptive organisational forms because it minimises harmful conflict and cost, facilitates work process, and promotes effective responses to crises. Trust is also a crucial enabler of supply chain collaboration (Fawcett et al., 2012). Pérez-Morote et al.,

(2020) reported that the higher the level of trust in different e-applications, the higher the use of these services and vice versa. Accordingly, trust serves as a motivator for a transformative supply chain because it influences the relationship between two parties. Tran (2014) claimed that customer willingness has a significant role on digital supply chain adoption that can enhance its success level. Consumers’ attitude towards innovation and digitalisation, as well as their willingness, exerts a direct effect on essential organisational aspects, such as technology, staff, culture, and processes. A willing customer becomes committed to adopt digital supply chain process, services, and strategies; thus motivating consumers to acquire more knowledge. Additionally, Youna et al., (2013) and Giunipero et al., (2012) highlighted the significance of customer willingness for the deployment of technology by integrating organisation vision, information sharing, and guidance into a comprehensive organisational business strategy.

H4: Trust mediates the relationship between digital supply chain drivers and digital supply chain susess.

H5: Customers willingness mediate the relationship between digital supply chain drivers and digital supply chain susess.



**FIGURE 1
THE STUDY MODEL**

RESEARCH METHODOLOGY

This study executed a survey on a sample of Jordanian customers. The unit analysis of this study refers to different customers from firm located at varying regions. In selecting the sample, the convenient sampling approach was applied. Overall, 259 questionnaires were collected via internet due to the widespread of COVID-19 and its subsequent lockdowns. Table 1 summarises the characteristics of the study sample.

Table 1 SAMPLE CHARACTERSTICS			
Catagories	Gender	Ferquency	Percentage
Gender	Male	124	47.9
	Female	135	52.1
Education Level	Diploma or Less	29	11.1
	BA	149	57.6
	Higher education	81	31.3
Total		359	100%

A structured questionnaire was used to collect primary research data. The five-point Likert scale was used in the questionnaire, whereby the respondents judged different statements about independent, mediated, and dependent variables. Partial least squares structural equation modelling (PLS-SEM) via SmartPLS 3 was applied to test the research hypotheses and the conceptual model. Following Sarstedt et al., (2016) and Hair et al., (2013), the PLS-SEM is a composite structure that analyses mediation correlations. The PLS-SEM is suitable for analysing correlations among constructs derived from a huge number of indicators (Hair et al., 2017; Sarstedt et al., 2016).

FINDINGS

Measurement and Structural Model

According to Hair et al., (2017), default settings for PLS algorithm can be applied with weighting scheme set to Factor. Consistent internal reliability can be determined using Cronbach's Alpha and loadings of individual indicators, which should exceed 0.6 (Nunnally & Bernstein, 1994), whereas average variance explained (AVE) should exceed 0.5 to ascertain convergent validity (Fornell & Larcker, 1981). All indicators in this study exceeded the threshold values, while Table 2 summarises the final validity and reliability of this study.

Table 2			
ALPHA, CR AND AVE			
Construct	Cronbach's alpha	CR	AVE
Digital supply chain	0.899	0.919	0.588
Technical skills	0.829	0.874	0.537
Trust	0.872	0.907	0.661
Services availability	0.874	0.907	0.661
Government support	0.922	0.945	0.811
Customer willingness	0.862	0.906	0.707

Discriminant validity, which identifies the degree to which latent variables are distinct from one another (Hair et al., 2017), is determined via cross loadings and Fornell-Larcker criterion with cut-off points of 0.90 and 0.85 as the acceptable values, respectively (Hair et al., 2011; 2019). Cross loadings verify that each indicator possess the highest loading value with the construct to which it is assigned, whereas Fornell-Larcker criterion verifies that the square root of the AVE of each construct exceeds the highest correlation with any other construct (see Table 3).

Table 3						
DISCRIMINANT VALIDITY						
Construct	CW	DSCS	GS	TS	T	SA
Customer Willingness (CW)	0.841					
Digital Supply chain Success(DSCS)	0.628	0.767				
Government Support(GS)	0.461	0.597	0.900			
Technical skills(TS)	0.654	0.679	0.425	0.733		
Trust (T)	0.641	0.690	0.571	0.700	0.813	
Services availability (SA)	0.535	0.732	0.645	0.689	0.714	0.813

The PLS algorithm was run first to estimate path coefficients, R². Next, bootstrapping with 5000 bootstrap re-samples was executed to identify the significance of the effects. The value of R²=0.535 for digital supply chain success denotes that >50% of the variance in digital supply chain success is explained by the model. Tables 4 and 5 tabulate the significance of the path coefficients.

Table 4					
Research hypothesis results (Direct)					
Path	Original sample	Sample mean	T statistics	P value	Hypothesis result
Technical skills >> Trust	0.404	0.408	6.803	0.000	Accepted
Technical skills >> Customer Willigness	0.550	0.550	9.108	0.000	Accepted
Government Support >> Trust	0.202	0.200	3.531	0.000	Accepted

Government Support >> Customer Willigness	0.216	0.218	3.876	0.000	Accepted
services availability >> Trust	0.305	0.305	4.734	0.000	Accepted
services availability >> Customer Willigness	0.017	0.019	0.229	0.819	Rejected

Table 5					
RESEARCH HYPOTHESIS RESULTS(INDIRECT)					
Path	Original sample	Sample mean	T statistics	P value	Hypothesis result
Technical skills >> Trust >> Digital Supply chain sucesess	0.197	0.199	5.408	0.000	Accepted
Technical skills >> Customer Willigness>> Digital Supply chain sucesess	0.173	0.175	4.490	0.000	Accepted
Government Support >> Trust>> Digital Supply chain sucesess	0.099	0.098	3.030	0.003	Accepted
Government Support >> Customer Willigness>> Digital Supply chain sucesess	0.068	0.070	2.967	0.003	Accepted
services availability >> Trust>> Digital Supply chain sucesess	0.149	0.149	4.098	0.000	Accepted
services availability >> Customer Willigness>> Digital Supply chain sucesess	0.005	0.007	0.216	0.829	Rejected

As a result, both H1 and H2 are accepted. H3 denotes that services availability has an impact on trust and customer willingness. All digital supply chain drivers (technical skills, government support, & services availability) displayed indirect (via trust and customer willingness) and significant impact on digital supply chain success, except services availability via customer willingness. Therefore, the hypothesised mediation is supported in this study.

DISCUSSION AND CONCLUSION

The study findings revealed that the drivers of digital supply chain success had a direct impact on trust and customer willingness to adopt and use digital supply chain, as well as its various tools. This outcome is supported in past studies as well (see Wieland, 2021; Alsmairat & Aldakhil, 2021; Klimova et al., 2020; Ageron et al., 2020). The variables that serve as digital supply chain key success drivers are explained as follows: (1) technical skills denote excellent digital skills to use digital gadgets, whereby identification of skills and resources is crucial, (2) government support includes effective support from the government, such as infrastructure development, regulations and protection of customers, talent acquisition and retention, and building support via solutions for digital efforts, and (3) service availability that includes providing all digital services related to supply chain to all customers regardless of location. These aspects were retrieved from anecdotal evidence of prior investigations (see Perla et al., 2018; Samdantsoodol et al., 2017; Ivanov & Dolgui, 2020; Pérez-Morote et al., 2020; Giunipero et al., 2012). The present study offers empirical evidence regarding the significance of digital supply chain success. The strongest impact was observed for trust and customer willingness as the mediation factors between drivers and digital supply chain success. Wieland (2021) and Evans (2011) asserted that effective managerial frameworks can promote innovation supply chain, whereby this study contributes to that by highlighting the significance of digital supply chain success. According to Pérez-Morote et al., (2020), trust and customer willingness display a mediating impact on the correlation between all the drivers and digital supply chain success. This outcome adds to the literature, particularly on increasing the level of trust and willingness among consumers towards digital services (Fawcett et al., 2012; Tran, 2014; Youna et al., 2013). Consumer acceptance is bound to enhance the IT systems and digitalisation. The reported outcomes denote wider implications due to the relevance of consumer willingness and

trust with the drivers of digital supply chain success. This study has implications for multiple areas, including instrumentation and data, strategy, technology and innovation, collaboration, and capabilities. Therefore, future researchers may apply the indicators used in this present study to enhance the progress of digital supply chain. As for managerial implications, the outcomes may aid managers to decipher essential drivers that promote the success of digital supply chain. The indicators can be applied to establish effective self-assessment and monitoring procedures.

This study had assessed factors that can effectively promote the success of digital supply chain. The theoretical review presented in this study facilitated the execution of this study. Future studies may need to assess more factors that could possibly impact both the adoption and success of digital supply chain. Work that extends the framework mechanism can expand its suitability for other contexts. This study has several setbacks, such as no criterion for selection of respondents. Besides, the results interpretation had been based on reflective literature review, as well as the researcher's perceptions and comprehension about the topic at hand. Additionally, the qualitative approach may offer in-depth details of the generated findings by employing grounded theory, interview method or other qualitative techniques.

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