Journal of Business Strategies, Vol. 15 No.2, 2021, pp 83-98 *DOI:10.29270/JBS.15.2(21).05*

INFLUENCE OF DIGITIZATION ON SUPPLY CHAIN PERFORMANCE IN THE FMCG SECTOR OF MANUFACTURING INDUSTRY

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ABSTRACT

The proposed research follows deductive approach, interpretivist philosophy and Causal or Explanatory research strategy. The study is exploring the perception of supply chain professionals regarding digitalization in supply chain and also exploring the real digital practices followed by the FMCG industry. For this purpose the researchers had collected data through filling questionnaires from respondents having knowledge of supply chain strategies and digital implementations on supply chain processes in Karachi. Questionnaires were filled through google forms with the help of friends and family to get most of the authentic data with questionnaire containing close-ended questions based on research objectives and research questions. Also it was make sure that respondents were have better understanding of digitalisation in supply chain and knowledge based on personal experience, past research articles, websites and research journals. The finding of the study suggest that the concept of digitalization among the supply chain professionals is vague and they do not consider the implementation of digital technology in supply chain to be effective and essential. The study identifies a need of creating awareness among the supply chain professionals regarding the advantages they can gain by the implementation of technology in supply chain and also there is a need to train the operational staff to accept change which is beneficial for them.

Keywords: *Digital Supply Chain, Supply Chain Agility*

INTRODUCTION

Background of the Study

It is an era of technological advancement; its progress has undoubtedly improved our lives in all area. When it comes to the field of business, digitalization is changing business world to as it contributes to its constant

change and development and allow companies to sustain a competitive advantage. According to Sellitto, Pereira, Borchardt, daSilva, and Viegas (2015) the development as well as advancement of digitalization has great impact on changing life and work of the people and it also emphasise on providing new challenges and opportunities for the companies in terms of operation modes and production in the market. Hence, in order to go through the development in the age of digitalization, many companies have started to take appropriate measures in rode to adopt digital technology in supply chain for improving the performance (Christopher, 2016). There will be a rapid and successful growth through adoption of digital supply chain network in the company. Digital technology has the power to drive the convergence of supply chain elements (Kache & Seuring, 2017; Memon, et al., 2021). While attempting this, it can help companies to develop a networked process that optimizes the entire enterprise rather than a separate function, bringing together designers, suppliers, manufacturers, distributors, logistics service providers, retailers and even customers. Vision, collaboration, and innovation to inspire new ways of thinking and working, saving companies a lot of money, and helping them gain a competitive advantage (Ivanov, Dolgui, & Sokolov, 2018; Gilal, et al., 2020).

The most important insights are not specific cases but the impact of digital technology (Schoenherr & Speier-Pero, 2015; Tunio, et al., 2017). In the various modes of supply chain transformation, one direction is to use digital technology to strengthen existing business processes, models or methods, and the other direction is to completely reshape your supply chain thinking and operations. For example, Cisco Systems, Inc. announced that supply chain and logistics are 'relevant in value, that is, from 2013 to 2022, in the company and industry (increased by digital innovation), revenue growth and cost reduction to approximately $3 trillion' (Pradabwong, Braziotis, Tannock, & Pawar, 2018). Due to the introduction of automation and digitalization, the whole supply chain management structure is impacted. The significant revolutionary development in the "field of Information Technology (IT)" and the "introduction of industry 4.0 in the manufacturing field" has many impacts to supply chain. In this paper, we are going to analyse the impacts of digital supply chain dimensions (AI and Big Data) on supply chain performance (Buyukozkan & Gocer, 2018; Tunio, 2020)

Digitalisation in the supply chain operations is an emerging concept around the globe which enable organizations especially those which relies upon their supply chain efficiency to gain a sustainable competitive advantage over the rivals and competitors (Haddud & Khare, 2018). It helps the manufacturing

firms to increase the visibility among the supply chain members and minimize the bullwhip effect from the supply chain. Digitalisation in supply chain also helps in identifying the loop-holes in the supply chain against which timely actions can be taken by the organizations to avoid adverse consequences (Iddris, 2018; Tunio, et al., 2021).

Consequently, Pakistan comes under the umbrella of developing countries where the primary focus of the manufacturing industry is on their supply chain efficiency (Zsidisin & Henke, 2019; Tunio, et al., 2021[2]). Due to the economies of scale, cost efficiency, effective labour and reduced cost of business manufacturing sector is transferred to the Asian developing countries from developed countries mainly Western countries, which the focus of the manufacturing sector towards the supply chain efficiency (Pundir, Devpriya, Chakraborty, & Ganpathy, 2019; Chaudhry, et al., 2021). Digital technologies nurtured a modern era of competitive-ness. Digital technologies allow for the integration of data and information from different sources and locations to start production and distribution of goods and services (Mussomeli et al., 2016; Tunio, et al., 2021). They are categorized under three broad areas, viz digital technology enablers, digital systems integrators and application technologies. The digital technology enablers provide the backbone that allows for the digital transformation of the industrial production (Gurria, 2017; Tunio, et al., 2021). These enablers include big data (Nguyen et al., 2017; Gunasekaran et al., 2017), Internet of Things (Atzori, et al., 2010; Moeuf, et al., 2017), and cloud computing (Aviles, 2015; Gantzia and Sklatinioti, 2014; XiMei, et al., 2016). Under the digital systems integrators are simulations, artificial intelligence and cyber-physical systems (Khaitan & McCalley 2015, Wang, et al, 2015, Monostori, et al, 2016). The application technologies are the applications through which the main productivity effects in industry are likely to unfold which include additive manufacturing/3D printing (Mellor, et al., 2014, Durach et al., 2017), autonomous machines and systems, and human-machine integration (Gurria, 2017). Giving these layers of the digital technologies we argue that companies should first establish the digital enablers followed by digital systems integrators and then finally the application technologies.

The use of innovative digital technologies allows companies to generate new forms of revenue and business value for organizations (Buyukozkan & Gocer, 2018). The quest for these novel technologies is not necessarily about the technology itself but their use to provide transformational effects on supply chain processes (Rai, et al., 2006; Xue, et al., 2013).

Building on this concept, we define Supply Chain Digitalization as the extent to which a focal plant implements novel digital technologies in their supply chain processes to conduct business with its suppliers and customers and the degree to which these technologies transform supply chain capabilities and operational performance of the plant.

In this paper, it is intended to develop a conceptual framework that describes the relationship amongst supply chain digitalization, supply chain capabilities and operational performance.

The proposed study aims to explore the influence of digitalisation on the supply chain performance. The significance of technology in the field of supply chain and how organizations can achieve operational efficiency through digitalisation. Conventional supply chain mainly focus on the cost efficiency overlooking the fact that incorporating technology with supply chain efficiency would increase the efficiency and reduce the lead time which would ultimately lead to cost effectiveness in long-term.

THEORETICAL BACKGROUND

The studies like Gurria (2017), Laaper (2017), and Dall'Omo (2016) have shown that digital technologies play a critical role in managing supply chain processes that cause performance gains for the respective firms. The foundation of digital transformation requires a complete understanding and holistic analysis of the internal and external capabilities (Uhl, et al., 2014; Tunio, et al., 2014). However, there were limited academic researches that investigate how and why digital technologies could create performance gains by improving and transforming supply chain capabilities.

The digital technologies improve capabilities by allowing companies to curtail operating cost, improve product quality while increasing sales revenue through expanding market shares, developing more attractive products that meet customer needs, and creating strategic advantage that improve all business operations (Gurria, 2017; Tunio, et al., 2021). Researchers have recognized capabilities as an important source of an organization's operational strengths and competitive performance (Flynn & Flynn, 2004; Peng et al., 2008). In this proposed framework, Supply Chain Digitalization (SCD) serves to transform supply chain capabilities to improve operational performance of the firm.

Supply chain capability is defined as the ability of a company to identify, utilize, and assimilate both internal and external resources and information

to facilitate the overall supply chain activities (Bharadwaj, 2000; Wu et al., 2006). Capability studies have been used in recent supply chain research (Ferdows & De Meyer, 1990; Noble, 1995; Boyer & Lewis, 2002; Flynn & Flynn, 2004; Singh, et al., 2015) to reframe the conversation into how and why capabilities create performance gains for the firm. Capabilities studies in general are informed by Resource-Based View (RBV) of competitive advantage that focuses on a firm's ability to consciously and systematically create distinctive capabilities which enable the firm to gain competitive advantage in the marketplace (Penrose, 1959; Wernerfelt, 1984; Hulsman et al., 2008; Yusuf et al., 2014). A company's resources provide the firm with unique capabilities that allow it to manage change and identify new opportunities (Barney, 1991; Shaikh, et al., 2021).

H1: There is a significant impact of perception of digitalization in supply chain on supply chain performance of FMCG sector of manufacturing industry.

Digital transformation has been in place for years and supply chains have not been exempted from it. Supply chains operate in an increasingly connected environment, based on the collaboration of people, processes and devices. The digitalization of processes, which leads to increasing the exchange of data and information along the supply chain, helped by a massive connectivity level, has led to the rise of "cyber supply chain, a supply chain enhanced by cyber-based technologies to establish an effective value chain" (Kim & Im, 2014; Afshan, et al., 2021).

H2: There is a significant impact of digitalization and supply chain on supply chain performance of FMCG sector of manufacturing industry.

Emerging technologies are set to transform logistics and transportation, which would change the existing flow of supply chain as we know it. This change is already prominent amongst various FMCG companies today. The process of digitalization is becoming a core driver into the world of supply chain. It is not possible for FMCG companies to succeed anymore without the help of digitalization. With the amount of trade and increasing demands of goods and supplies, manual labour is no longer an option. From the most basic to more advanced systems, technological assistance, evolved into various more complex devices. From systems that can automatically track moving goods to tools that can record warehouse goods, technological advancements led to the rise of a fully digitalized process. Supply chain management software are quickly emerging with on-demand warehousing

and logistics. Evolving customer channels contribute a great role when it comes to this new workflow. Thanks to a direct-to-consumer shift, there are greater opportunities and flexibility when it comes to supply chain operations, which means most FMCG companies require a tool that would support this dynamic environment. SCM software works as a customized solution to automate a business' supply chain operation. All requirements can be defined through a setup process to fit specific company needs, where organizations can spend less time for more productivity. SCM software became a major part in the way logistics operations are played. It creates a fully automated system for the FMCG industry; saving time, cost and ensuring the efficiency of their process. The examination of such system would be done through this whitepaper to accomplish its efficiency and benefits for the FMCG industry. By a thorough observation of an existing SCM system, ESKA SCM, and how it can work for FMCG companies, a clear view of how this software can help may be produced. A digitalized system may be truly beneficial to the FMCG sector and can be used to accelerate the supply chain industry. The goal is to understand how SCM software can help and how its deployment may function as the next standard for businesses today.

H3: There is a significant impact of influence of digitalization on logistics operations on supply chain performance of FMCG sector of manufacturing industry.

Digitization has changed our lives in many ways. Not only our private lives but our business environments have also largely grown and are still under the process of evolution. It has provided the organizations with new opportunities to grow beyond the boundaries of their home countries. Digitization of logistics has made it easy for the companies to operate globally. Logistics is the pillar of every supply chain. So, it is necessary for it to be strong enough to face the challenges to secure its organization. The purpose of incorporating automation in the logistics processes is to utilize the potential of technology to create value for customers by transporting their needed products at the right place and at the right time in the minimum cost (Lai, Wong & Cheng, 2010; Afshan, et al., 2021). Digitized logistics is a holistic approach which revolves around customers. Modern logistics require highly integrated end-to-end system which ensures flow of mandatory information and goods for the purpose of value creation along the supply chain. Logistics is now becoming a new approach of providing opportunities of distribution and new business (Bucherer & Uckelmann, 2011; Gilal, et al., 2021). Digitization of logistics is a potential process, which can result in enhancing the customer value that

supply chain offers to the customers (Junge, Verhoeven, Reipert, & Mansfeld, 2019). Especially with the incorporation of the data-driven logistics the strategic importance of logistics can increase thereby, increasing the worth of the systems or functions associated with the logistics of an organization. Over the past few decades, digitization of processes has really increased pace and its usage has become unavoidable. Companies are widely using it for increasing its corporate strength, efficiency, and getting competitive edge over the rivalries in the industry. Barreto, Amaral, and Pereira (2017) asserted that globalization is the phenomenon of eradicating boundaries and integrating national and regional economies, cultures, and societies through trade, communication, transportation. Digitization may have some adverse effects on the industries. Digital logistics will become very important and essential tool in the future not only for the magnates of the industries but also for the small-sized companies allowing them to compose globally with ease and compete.

Globalization is a crucial factor for development of logistics operations. Globalization comprises of high competition, incoming of foreign investment, increased volume of trade, and establishment of multinational companies. Ceniga and Šukalová (2014) suggest that with the incorporation of digitization in the functions of logistics, whole paradigm of supply chain has shifted improving the supply chain efficiency, reduced the costs and improves the service quality. Globalization vastly supports logistics of organizations making them competitive in the industry (Richnák & Porubanová, 2017; Katper, et al., 2020). According to the studies done in the past, it is suggested that integration of technology in organizational processes is mandatory to improve communication and coordination with partners, this leads to enhanced skills of decision making and higher performance of logistics (Lai, Wong, & Cheng, 2010). Digitization of logistics is basically the practice of incorporating technology into its functions in order to improve its functionality (Ngai, Lai, & Cheng, 2008; Tunio, 2020[1]). The objective of logistics management is to control the flow of products and information, transformation of material into finished goods, and distribution of those goods using proper channels. Technological assistance in the processes of logistics increases the coordination between all the partner firms establish string basis of electronic connections, and logistical coordination (Daly & X.cui, 2003). Performance of logistics cannot improve if the integration of technology is not properly infused in the functions (Wilson, Iravo, Tirimba, & Ombui 2015). These choices are made strategically by the management

of the organizations. These strategic choices include configuring business processes, structure of the organization, and application of information technology in order to be responsive to the changing business environment (Lai, Wong, & Cheng, 2008). With the time moving towards more of a technological world, business processes are becoming more and more complex and difficult to handle. Production, manufacturing, logistics and rest of the functions of the supply chain has become complex tasks. The essential role of technology has drastically changed the concept of logistics and improved its efficiency, and its importance in unquestionable (Nick & Pongrácz, 2016). Computers, automation and robots existed in previous decades, but the most sophisticated opportunities provided by the Internet revolutionize their use, and the opportunities they provide. The increasingly cheaper solutions allow the entrepreneurs to monitor the activities, operation and processes of machines, materials, workers and even products themselves, and to collect, analyze and utilize data in real-time decision making (Nagy, Oláh, Erdei, Máté, & Popp, 2018).

H4: There is a significant impact of role of technology in 3tier supplier integration on supply chain performance of FMCG sector of manufacturing industry.

Recently, the Manufacturing Industry in Developing Countries (MIDC) has been facing unusual competitive-ness pressure generated by the new business trends. To face with this pressure, the manufacturing industries have tried to upgrade their operations by using different manufacturing techniques such as Total Quality Management (TQM), Business Process Re-engineering (BPR) and Lean Technology (LT), and others. Despite these efforts, the MIDC has not yet made their share of markets. This drives industry to get additional efficiency from their production systems. Effective Supply Chain Management and Supply Chain (SC) integration are becoming increasingly critical factors for business success. The integration of SC members can significantly support the MIDC to face the constantly changing competitiveness scenarios. Companies versus companies have been replaced with supply chain versus supply chain competitiveness strategy. However, the number of companies that have truly integrated their supply chains to take advantages of this opportunity is still small. The effects of globalization and fiercer competition have forced firms to focus their attention on entire supply chain integration (End-to-End) rather than on effectiveness and efficiency of separate business functions within their own premises. Firms both in developed and developing countries are trying to integrate more in

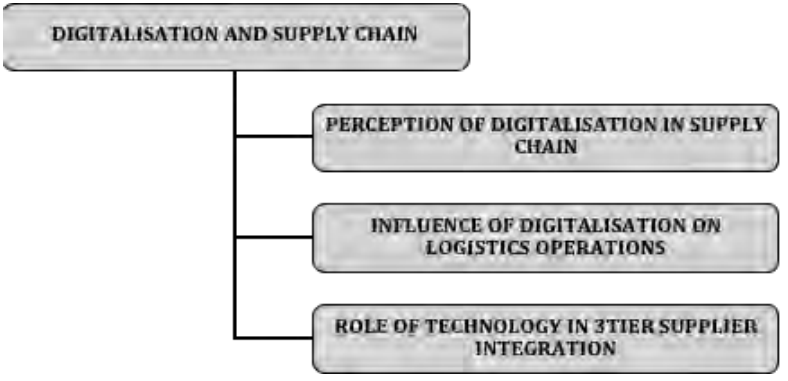
their production activities such as sourcing, manufacturing, and delivery processes. The MIDC has been a part of the global supply chains for long time as a supplier of raw material and manufacturer of finished products. Nevertheless, some sectors like textile, garment, and leather industries even though such cooperation and integration is at infant stage; it does not create value as expected.

METHODOLOGY

This study is based on 'Deductive Approach' as it is quantitative in nature. Also it is based on 'Causal or Explanatory Research Design' reason being in this research faced by us is the relationship between different aspects of implementation of digitalization in supply chain of FMCG sector. The research method is 'Quantitative Research Method 'because data is collected through filling questionnaires and somehow secondary data is also used.

CONCEPTUAL FRAMEWORK

Fig. 1: Conceptual Framework



DATA ANALYSIS

Reliability Statistics

Table 1: Case Processing Summary

		N	%
Cases	Valid	195	100.0
	Excluded[a]	0	.0
	Total	195	100.0

a. List wise deletion based on all variables in the procedure.

Table 2: Reliability Statistics

Cronbach's Alpha	N of Items
.888	4

Cronbach's Alpha is used to prove the reliability of data. If the value

of Cronbach's Alpha is more than 7.0 then we consider the data is reliable enough to proceed for further analysis. The above table shows that the value of Cronbach's Alpha is .888 which means data is reliable and acceptable to proceed for further statistical analysis.

DESCRIPTIVE STATISTICS

Table 3: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PDSC	195	21.00	40.00	32.8000	4.38319
DSC	195	19.00	40.00	32.9231	4.93768
IDLO	195	13.00	35.00	28.4615	4.48391
RTSI	195	12.00	35.00	27.6462	4.47478
Valid N (listwise)	195				

This model or statistical test reflects that Digitalization in supply chain is leading with the highest mean i.e. 32.9231. The second highest mean is of Perception of digitalization in supply chain i.e. 32.8000. The third highest mean is of influence of digitalization on logistics operations i.e. 28.4615. Then we have fourth mean of role of technology in 3-tier supplier integration, which is 27.6462.

CORRELATION ANALYSIS

Table 4: Correlations

		PDSC	DSC	IDLO	RTSI
PDSC	Pearson Correlation	1	.747**	.617**	.462**
	Sig. (2-tailed)		.000	.000	.000
	N	195	195	195	195
DSC	Pearson Correlation	.747**	1	.783**	.653**
	Sig. (2-tailed)	.000		.000	.000
	N	195	195	195	195
IDLO	Pearson Correlation	.617**	.783**	1	.715**
	Sig. (2-tailed)	.000	.000		.000
	N	195	195	195	195
RTSI	Pearson Correlation	.462**	.653**	.715**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	195	195	195	195

**. *Correlation is significant at the 0.01 level (2-tailed).*

The correlation model reveals that the highest correlation is between Perception of digitalization in supply chain and of influence of digitalization on logistics operations that is r=.783. The second highest correlation as seen in the table is between Perception of digitalization in supply chain and Digitalization in supply chain that is r=.747. The third highest correlation is between digitalization in supply chain and Design and role of technology

in 3-tier supplier integration that is r=.715. The fourth highest correlation is between Perception of digitalization in supply chain and influence of digitalization on logistics operations that is r= .617.

All the pairs range between .783 and .617.

TESTING OVERALL MODEL (REGRESSION ANALYSIS)

Table 5: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.429	1.484		-.289	.773
	PDSC	.474	.053	.421	8.977	.000
	IDLO	.441	.065	.400	6.739	.000
	RTSI	.190	.058	.172	3.268	.001

a. Dependent Variable: DSC

The t- value of all independent variables are more 2 and significant is .000 which means all significant hypothesis are accepted and null hypothesis are rejected.

Standard error plays a very key role through which value we can evaluate out how much data can be varied. If we will increase the sample size, the chances of this error can be reduced. Standard Error of Constant is -.289 which reflects that 28.9% of the data from the mean of the sample can be fluctuated or varied. The Standard Error of perception of digitalization in supply chain .053, influence of digitalization on logistics operations is .065 and role of technology in 3-tier supplier integration is .058.

ANOVA

Table 6: ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3502.963	3	1167.654	181.779	.000[b]
	Residual	1226.883	191	6.423		
	Total	4729.846	194			

a. Dependent Variable: DSC

b. Predictors: (Constant), RTSI, PDSC, IDLO

The statistical test ANOVA reflects the model fit. In this table, the sum of squares reveal the complete variability that is near to mean. The sum of residual is actually the sum of squared error in prediction, the sum of square. *Df* stands for the Degree of Freedom, which is attached or connected to the variance. It is the total number of respondents minus one. Moreover, F value shows the total model fit. It reveals that whether independent variable has forecast dependent variable well or not. The rule says if it is higher than 2 so this means that model

is good enough and independent variable has predicted dependent variable correctly. In this model, it is 181.779 that are without a doubt acceptable.

DISCUSSION

Based on the basis of hypotheses, the variables were tested, results of variables like Perception of digitalization in supply chain, influence of digitalization on logistics operations and Design and role of technology in 3tier supplier integration found consistent with earlier studies . the study is indicating that acceptance of all alternative hypothesis.

Table 7: Summary of Hypotheses

Hypothesis	Result
There is a significant impact of perception of digitalization in supply chain on supply chain performance of FMCG sector of manufacturing industry	ACCEPTED
There is a significant impact of influence of digitalization on logistics operations on supply chain performance of FMCG sector of manufacturing industry	ACCEPTED
There is a significant impact of role of technology in 3tier supplier integration on supply chain performance of FMCG sector of manufacturing industry	ACCEPTED

CONCLUSION

Perception of digitalization in supply chain on supply chain performance, influence of digitalization on logistics operations on supply chain performance and role of technology in 3-tier supplier integration are significant and relevant factors that more and less influence digitalization in supply chain on supply chain performance of FMCG sector of manufacturing industry.

RECOMMENDATIONS

After this research study, it has been observed that most of the companies are least interested in making their supply chain digital due to the multiple reasons discussed in the above study. Also employees are not aware from the advantages they can render by the making their supply chain digital therefore these are some of the recommendations which can help in promoting digitalisation in the field of supply chain in Pakistan:

1. Manufacturing companies needs to hire fresh talent which have idea and possess well develop concept of incorporating technology in the field of supply chain.
2. Legislative authorities should also impose legal obligations regarding vulnerable manufacturing processes and waste management of conventional supply chain.
3. Establishing strong supplier relationship helps the company to motivate

the suppliers to adopt technological modifications in their supply chain and integrate with the company for the best interest of both.

4. Establishing joint venture with technological firms can also help the companies in training the employees regarding technology and to better implement the digital technology suitable with the nature of the business.

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