The Impact of Digital Transformation on Supply Chain Management: A Study of How Firms Adapt

Dr. Ankita Nihlani¹ and Dr. Parvindar Kaur Chhabda²

¹Assistant Professor, Department of Management, Kalinga University, Raipur, India
²Assistant Professor, Department of Management, Kalinga University, Raipur, India
E-mail: ¹ku.ankitanihlani@kalingauniversity.ac.in, ²ku.parvindarkaurchhabda@kalingauniversity.ac.in
ORCID: ¹https://orcid.org/0009-0002-7447-8544, ²https://orcid.org/0009-0006-9775-7254
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Abstract - Businesses need to embrace digital if they want to succeed in the cutthroat business climate of today. The goal of supply chain management is to maximise value for stakeholders and customers while also achieving operational efficiency. The planning, carrying out, managing, and verifying of store network exercises do this. The benefits and drawbacks of integrating digital technology into supply chain management practices are examined in this study. This analysis also aims to shed light on the potential advantages of advanced change for developing market organisations that aspire to become global. By using a qualitative methodology and carrying out a thorough analysis of six successful real cases in three different emerging markets-Iran, Bangladesh, and Pakistan-the study also seeks to offer recommendations for businesses in emerging markets on how to use digital technologies to optimise supply chain management processes and facilitate international business. The ultimate goal of this research is to improve knowledge of the role and importance of digital transformation in supply chain management for companies that operate in developing countries and to offer these companies useful advice so they can successfully compete on a global scale.

 ${\it Keywords:}$ Digital Transformation, Digital Marketing, Business Management

I. INTRODUCTION

Computerised transformation is something that any organisation that wants to thrive in the fiercely competitive business world of today has to accept. According to (Tolstykh et al., 2019), digital transformation is the process of integrating various digital technologies into different corporate processes, leading to notable changes in operations (Bruselas et al., 2024). Computerised transformation has altered traditional corporate working patterns and led to the development of clients' preconceptions about how values are provided to them. In order to improve customer loyalty, advance business tasks, and spur development, it involves converting manual cycles into computerised ones that are more precise, practical, easy to use, and affordable. Technological advancements like robotization, distributed computing, human intelligence, Web of Things (IoT), information investigation, and AI are used in this process (Klein, 2020). Implementing computerised change is typically difficult and requires significant acclimatisation to the organization's hierarchical culture and action plans.

Computerised change seeks to outmanoeuvre competitors in this area by promoting new buyer values and assumptions and focussing on their capacity for development and variation to shifting economic scenarios. Consequently, a company that fails to adapt to this kind of advancement runs the risk of being outdated or falling behind the competition (Kioskli et al., 2022). Any company that transfers products and services from supplier to customer needs a supply chain. Mechanisation, artificial intelligence, distributed computing, and the Internet of Things (IoT) are examples of computerised innovations that have been known to replace manual systems with more dependable and cost-effective solutions, enabling businesses to optimise their production network operations (Schneider & Kokshagina, 2021). Automation expedites all corporate operations, minimises manual labour, and lowers the risk of human error (Jyothi et al., 2024). DT in supply chain management shown in Fig. 1.

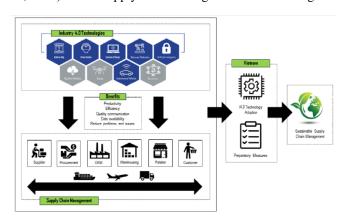


Fig. 1 DT in Supply Chain Management

Among the computerised innovations that have been known to replace manual systems with more dependable and cost-effective methods are mechanisation, distributed computing, human intelligence, and the Internet of Things (IoT) (Schneider & Kokshagina, 2021). This has allowed organisations to optimise their production network operations. Automation expedites all company operations, lowers manual labour, and minimises human mistake. Computerised reasoning, also known as simulated intelligence, can assist the association in quickly identifying

any problems by providing insights into the operations of the store network and motivating the organisation to take proactive measures. Similar to other computerised innovation instruments, IoT can provide continuous product tracking, continuous perceivability into inventory network chores, easy access, and remote observing for production network action control (Warner & Wäger, 2019). Thanks to cloud-based frameworks, members of the store network can exchange information, collaborate on planning and anticipating, and more effectively and efficiently coordinate their general tasks. As a result of increased transparency and adaptability of the production network, this can be quite helpful in fostering a sense of mutual trust between the parties. A growing country that exhibits economic growth and development and is increasingly participating in the global market is considered an emerging market (Ajayi-Nifise et al., 2024). These qualities, which are becoming more and more crucial for companies hoping to compete against big rivals in the global market, enable digital transformation (Oleksandr et al., 2024). Digital technologies also have a big impact on the supply chain, which is crucial for any company looking to go abroad from an emerging market. The purpose of this study is to look into how digital technologies may help with international business and how supply chain management in emerging markets might benefit from their use (Vasilev et al., 2020).

In this case, the introduction is examined in section 1 of the article. Section 2 describes the review of the work further Section 2 and 3 explains the goal of the work digital technologies, and Section 4 concludes the project.

II. LITERATURE REVIEW

The digital transformation of the supply chain brings with it both potential and problems, given the features of an emerging market. In the long run, advanced innovation can save costs and improve the functionality of inventory networks by improving their perceivability straightforwardness. However, the requirement for adequate foundation, skills, and processes makes it difficult to incorporate cutting-edge devices and advances (Mihalcea, 2017). Finding out if small and medium-sized enterprises (SMEs) can handle the problems posed by the digital revolution in the supply chain was the aim of the study. Their findings unequivocally show that SMEs, for a number of reasons, mostly related to their restricted capacities, give less thought to planning for digital transformation (Mazurchenko & Maršíková, 2019) examined a few well-known multinational corporations worldwide to investigate how IT setup affects store network reconciliation and operation. Their choices included case studies of overcoming hardship and effective practices from established global associations. By the way, the evaluation didn't discuss the particular issues and opportunities they ran into or make predictions about what could have happened if the organisations had started in developing nations. Trushkina et al., (2020) have talked about the advantages and difficulties of the digital supply chain. They have looked into the challenges and results of the digital transformation of supply chain management in emerging

market. However, the study mostly concentrated on internal operational improvements stemming from the use of digital technologies, rather than taking into account the wider implications for global business expansion. Tavoletti et al., (2022) looked into the expansion of logistics and supply chains. In addition, the evaluation emphasises on businesses established or operating in developed nations. They looked into the importance of digital technology in the supply chain and the need for this change for companies who are concerned with globalisation in the fast-paced global market of today. Zhang & Chen, (2024) have investigated the potential financial gains from supply chain digital transformation for companies considering competitiveness and the institutional importance of supply chain technology adoption for companies in developing countries.

Nevertheless, this work aims to fill in a knowledge gap regarding the use of technological advancements in the development of business sector production networks and executives' capacity to support international exchange. The ability of the supply chain to grow internationally is significantly influenced by digital transformation; yet, previous research has mostly concentrated on supply chain management digital transformation in developed nation enterprises. A small business from an emerging market was able to compete with larger organisations internationally by using digital technology in supply chain management to facilitate its international commerce. This study looks at how that was managed. The findings may help businesses in emerging markets better grasp the advantages and difficulties of transforming their supply chains to be digital.

III.RESEARCH FRAMEWORK

This research investigates how digital transformation in supply chain management helps businesses to grow and capitalise on their capabilities to accomplish global expansion using the framework of dynamic capabilities. The three primary parts of the framework are sensing, seizing, and transforming (Gilch & Sieweke, 2021). Sensing is the capacity of an organisation to recognise and predict changes in the business environment, such as new trends in the market or changes in customer preferences. Seizing refers to a company's capacity to adapt swiftly and efficiently to these developments by reallocating resources and reorganising already-existing capabilities. The ability of a company to innovate and create new skills in order to compete and prosper is the final component of transformation (Martínez-Morán et al., 2021). Supply chain management through digital transformation improves a company's ability to sense the world by giving it access to real-time data and analytics that let it keep an eye on and react to changes in the business environment. Additionally, it enables businesses to take advantage of opportunities by quickly adjusting resource allocation and supply chain operations to reflect shifting market conditions. Lastly, the creation of new business models and innovation are made easier by digital transformation, which can spur growth and market expansion (Montero Guerra & Danvila-Del Valle, 2024). The paradigm of dynamic capabilities offers a useful viewpoint for analysing how supply chain management's digital revolution may support international growth. Digital transformation enables businesses to leverage their internal resources and capabilities to create long-term competitive advantages in a fast changing global business environment by strengthening their detecting, seizing, and transforming capabilities (Fernandez-Vidal et al., 2022). Using an Inductive Method and Reasoning shown in Fig. 2.



Fig. 2 Using an Inductive Method and Reasoning

The interpretive approach previously indicated will serve as the focal point of the qualitative research methodology for this in-depth investigation. It refers to the verbal or narrative summarisation of results and implications obtained from data gathering with qualitative techniques as outlined in the next topics (Guerra et al., 2023). The primary reason for choosing this approach was to critically examine the theoretical framework and research methodologies related to the main theme and goal of the study. In order to provide context for the findings, the interviewees were also described. Additionally, the authors will look at the patterns of the companies in relation to the research subject, which includes how digitisation affected them in different ways. Additionally, in order for this study to make some conclusive findings, enterprises from emerging markets are taken into account. A case study tactic will be employed in conjunction with the other previously mentioned qualitative methods, adhering to the qualitative research style. Using the case study approach, it is possible to obtain a thorough and in-depth understanding of a subject or issue in terms of any specific group or circumstance through the investigative process, leading to a meaningful outcome. Smith says that the primary distinction between case studies and other qualitative research methods is the object of concentration and target, which is further elaborated in the paragraphs that follow in relation to the interpretation of (Alder & Dinnen, 2022). In order to obtain the necessary knowledge, the research process for this study involves sampling. Next, information is gathered from trustworthy sources and specialists of the mentioned corporations from developing markets are interviewed. There will be six Indian companies in the sample. The main justification for choosing these businesses is that they have integrated digital technology throughout the supply chain, as required by the study. The selected organisations are proactively implementing contemporary digital technologies to transform their supply chains, addressing all identified areas and research enquiries for this study. Because of this, a limited sample size was selected for this study in order to maximise in-depth insights about several concepts supporting the research topic from the selected companies, as well as to ensure that every point was noticed and that all pertinent features were covered in depth. Because it preserves the quality of the paper, an

inconspicuous example size is also crucial to increasing the feasibility and productivity of the research period. However, it also aided the experts in comprehending the computerised change process in the production network of the selected associations, which allowed them to reach a meaningful and firm conclusion (Díaz-Garcia et al., 2023).

The majority of the data used in this study will originate from reliable sources. The majority of the information and findings in light of reasonable conjecture will originate from interviews and vital information examination. Additionally, every piece of information collected will guarantee that this research is as genuine and accurate as possible, leading to a valuable conclusion about the companies' stepping stones to achieving digital supply chain amendment. This, in turn, will open up new opportunities for the companies, including global attention. Additionally, in order to obtain this information, executives of the selected organisations from expanding business sectors will be interviewed by the specialists in charge of the inventory network.

IV. EXPERIMENTAL ANALYSIS

Six companies were selected overall using basic random selection. The participants' sample was selected from a number of internet resources. India is home to the vast bulk of the participating businesses. Microenterprises and proprietors of small and medium-sized firms participated in the quantitative study. As entrepreneurs, they offered their distinct perspectives as industry leaders and their organisational context's understanding of digital culture. Questionnaire response rate shown in Table I.

TABLE I QUESTIONNAIRE RESPONSE RATE

	Number of questionnaires	Proportion
Returned	3	50%
Not Returned	3	50%
Total	6	100%

The primary issues with reliability are the consistency and stability of the outcomes generated by the research instruments and methodologies. The Cronbach's alpha calculation method is used to verify the internal consistency of the research and the dependability of the data. Generally speaking, a Cronbach's Alpha reliability score of 0.6 to 0.7 is considered sufficient, and 0.8 or more is considered extremely exceptional. A Cronbach's Alpha value higher than 0.95 is not necessarily indicative of duplicate work, yet it is still advised to avoid it, as (Zhang & Chen, 2024) notes. Reliability Analysis shown in Table II.

TABLE II RELIABILITY ANALYSIS

Description	Cronbach's Alpha	N of Items	Comments
Understanding digital culture in supply chain	0.936	3	Good
Implementing digital transformation in supply chain	0.932	6	Good
Value creation from digital transformation in supply chain	0.964	11	Good
Overall	0.900	20	Good

Digital Transformation and Supply Chain

The corporation has integrated cloud-based software and the Internet of Things into its supply chain system, recognising them as significant digital technologies. When the corporation made the decision to join the international market in 2012 after growing to prominence in Iran, the digital revolution got underway. To take a long-lasting and manageable step towards globalisation, the association updated its production network and integrated IoT into its inventory network activities. "IoT implementation helped the organisation grow at night more than we anticipated," the respondent said. Productivity improvement from the digital transformation shown in Fig. 3.

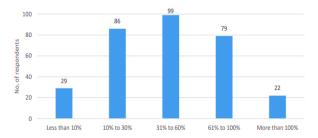


Fig. 3 Productivity Improvement from the Digital Transformation

The supply chain system was completely altered by the accuracy and transparency that IoT brought about on its own. As a result of their leadership, the organisation was able to drastically cut its monthly fixed costs, drastically cut annual waste, and improve the accuracy and efficiency of both local and foreign supply chain systems. The ability of organisations to use IoT has also evolved in recent years. According to the interviewee, "IoT offers operationally useful data." The potential to use the data provided by an operation increases with its size. This indicates that since the technology's adoption, the benefits it provides to the organisation have significantly improved and changed. In 2014, the company underwent a second phase of digital transformation when every piece of information was moved from a centrally situated device in the corporate office to cloud-based software. This made it possible for the organisation to have straightforward access from anywhere in the world. Given that cloud-based programming allows partners to access information progressively as long as they have a web association, and that IoT offers ongoing transparency and precision in every situation, including the development of products and strategy activities, this has been a tremendously helpful change for Association A's tasks. Furthermore, the interviewee states that this has allowed the organisation to increase partner trust and pleasure, which is its biggest asset (Zhang & Chen, 2024).

Digital Transformation Opportunities

Since the organisation is a producer that creates, markets, and distributes its products, numerous departments have contributed to the growth of the business from the beginning. But as a vital component of the company, a sizable supply chain has been crucial to this journey. The organisation has been able to optimise the entire supply chain system through

the implementation of digital transformation, which has reduced risks, minimised human error, and improved supply chain resilience. Digital Transformation Opportunities shown in Fig. 4.

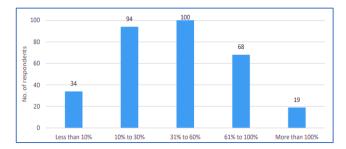


Fig. 4 Gained Income through the Digital Revolution

Here is an example of how, in one of the numerous areas in which they are being employed, the aforementioned digital technologies have helped Organisations supply chain to run smoothly, accurately, and efficiently. For example, there are three stages to the IoT deployment process at the warehouse: receiving the items, managing the shelves and recording inventory, and distributing the orders. Wearable scanners are utilised as soon as pallets and goods arrive at the warehouse to scan them before they are sent out. To confirm that the boxes have been received, this data is then sent to Internet of Things devices. After that, the objects are given uniform labels or stickers for identification and placed on certain racks with scale sensors installed for security. After the objects are identified by IoT sensors based on their weight and size, they are placed on pre-defined outlines. Cloud connectivity and mathematical computations are used to continuously verify the weight and inventory levels on the shelves. Employees are urged to look for misplaced items if any discrepancies are discovered. Before implementing digital technology, many manual errors were encountered by enterprises; this method alone has minimised those errors. Customer Contentment with the Digital Shift shown in Fig. 5.

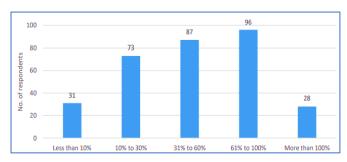


Fig. 5: Customer Contentment with the Digital Shift

Because of automation, IoT has also significantly improved inventory management accuracy in warehouse operations. The reply clarified, "Staff never again need to spend hours making sure the right inventories are in place." The overall fixed expenses have decreased as a result of greater precision and fewer workers being needed to operate the warehouse. The precision and speed of executive requests have increased thanks to process robotization. For example, the warehouse automatically prints a sticker with the delivery details when a consumer places an order. Information on the order's needed

size, shelf numbers, and delivery time can be obtained by scanning the barcode on the label. Upon receiving the package request from the customer, the inventory is updated automatically. The accuracy of order packing is also enhanced by IoT. For instance, the order status might be updated to "Packed" by the person in charge; if the corresponding shelf does not detect that the products have been taken down from the stands, it will notify the appropriate person. They can make sure everything is in order by double-checking the box and the rack thanks to the notification. Wireless temperature and humidity sensors were also installed in the warehouse by IoT sensors to regulate the thresholds needed for each product. Because of the design of the product and the combination of paste and cotton in each pack, they can withstand a high level of moisture. Things eventually lose their link when the humidity rises, and they are unable to perform at their best when installed on the final client's house. "In moist nations like Malaysia, this could turn into a tremendous issue, and the entire task could come up short," the person interviewed stated. However, because of these IoT capabilities, the stockroom partner will always be prepared in case the distribution center's moisture level rises. The idea holds true for both ambient temperature and heat. Warehouse management has become easier thanks to the objects' connectivity that are associated with tasks that require human intervention (Brunetti et al., 2020).

Digital Transformation Contributions to Internationalization

According to the interviewee, "one crucial factor for businesses looking to go global is the digital transformation of their supply chains. The three main components of success in international business—reducing costs, raising customer happiness, and improving operational efficiency—are all aided by supply chain transformation. Sole distributorship, which is fulfilled by a local company in each nation, forms the basis of the association's globalisation process. Essentially, the association enters into a protracted circulation agreement with an optional organisation to sell the material in their area. Regarding this contract, each side would be making a distinct promise. The distributor pledges to meet its monthly sales goal and to the organisation by keeping standard-quality merchandise available. These kinds of alliances can only succeed if both sides uphold their end of the bargain and have mutual trust. By integrating digital technologies into its supply chain, the company is able to offer the most efficient shipping routes and services to its customers while also staying constantly informed of the inventory requirements in each location. Additionally, the organisation has a greater chance of planning its appearances because of the steady following and visibility of the cargo in transit. Shipments by sea are made all the time, and their arrival times vary from a few weeks to many months. IoT devices track the temperature and humidity levels of the containers during the shipment voyage to guarantee that the items arrive in optimal condition.

The candidate gave an example including the live location and route forecast capability of IoT. The Korean accomplice had once asked a massive inn rebuilding job, which was essential for the item's branding. The best possible quality should have been provided to the establishment administration. The IoT's real-time tracking capability allowed the organisation to be informed in advance of the shipment's delay. But because of the tight project timetable, this one-week delay can result in the hotel project being cancelled. Because of this early warning, the company was able to organise a backup plan and handle part of its inventory through airfreight. Therefore, the Korean partner may have begun the project with enough supplies to last for many weeks, and by the time the ocean shipment arrived, they had completed the job entirely. This modest quantity of real-time information guaranteed that the services sought would be given and strengthened the parties' mutual respect and confidence.

The examined organisations have also underlined this, stating that they have found the most cost-effective and time-efficient transportation routes with the aid of IoT technology. This has always been a huge assistance to businesses in their planning process. Consequently, the digital transformation of the supply chain is vital when it comes to internationalisation, regardless of the goals and plans of any individual company. All of the businesses featured in empirical studies have their internationalisation strategies, but regardless of the market they serve, they all firmly believe that they could not compete globally without the support and benefits of adopted digital technologies. Digital technologies are now essential to the supply chain systems of all six of the studied organisations, and they are critical to their performance.

V. CONCLUSION

Companies focus international expansion in order to boost their market share and income. Because of their expanding consumer base, cheaper labour costs, and supportive government policies, emerging countries present substantial prospects. Cultural disparities, unstable political environments, and operational complexity are some of the difficulties that come with doing business internationally. For businesses to be successful, a thorough understanding of their target markets is therefore essential. Businesses can benefit greatly from the integration of digital technologies into supply chain management. It can increase functional productivity, for starters, by computerising repetitive cycles and providing continuous information to react swiftly to changes in the organic market. Second, it can enhance the buyer experience by improving perceivability and correspondence throughout the inventory network. Customers who can track their products and receive information on delivery times feel more satisfied and loyal. In conclusion, computerised innovation may help organisations develop and expand new plans of action by leveraging data and analysis. Businesses can employ data analytics, for example, to determine current market trends and client demands in order to create new products and services that suit those needs.

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