

# “Connected we stand, disconnected we fall”. Analyzing the importance of digital platforms in transnational supply chain management

Importance  
of digital  
platforms in SC

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Received 13 January 2022  
Revised 20 July 2022  
28 October 2022  
Accepted 29 October 2022

## Abstract

**Purpose** – This study seeks to explore the importance of digital platforms in restoring global supply chains interrupted by the coronavirus pandemic. Specifically, the research focuses on internally developed digital platforms and their potential to ensure supply chain continuity between developed and emerging markets.

**Design/methodology/approach** – Multiple comparative case studies have been selected for the research methodology. Eight cases concerning digital platform implementation for global SC management – four from developed countries and four from emerging markets – have been selected. The four pairs of cases represent four global supply chain mechanisms.

**Findings** – The results revealed that the use of internally developed digital platforms serves as a quick solution for immediate problems caused by ripple effects in global supply chain and negative environmental conditions. Digital platforms could therefore facilitate reciprocal monitoring and information exchanges between SC partners in different countries.

**Originality/value** – The digital platform research stream is in its early stages. Research thus far has mostly focused on externally developed digital platforms managed by an orchestrator. The platforms' usefulness in the dialogue between developed and emerging markets requires further exploration.

**Keywords** Digital platforms, Digital ecosystems, Global supply chain, Coronavirus pandemic, International trade

**Paper type** Research paper

## 1. Introduction

Environmental turbulence revealed global supply chains' instability and fragility (Mollenkopf *et al.*, 2020). Border closures, shipping restrictions and raw material

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procurement issues are regular company obstacles (El Baz and Ruel, 2021). In these situations, supply chains recovery might be achieved by strengthening company networks (Paul *et al.*, 2021). According to relevant literature, supply chain is an network that can form an ecosystem where partners share value and collaborate (Stolze *et al.*, 2016; Li *et al.*, 2021).

During overreaching problems, such as the coronavirus pandemic, the severance of existing links may cause a ripple effect (Ivanov and Dolgui, 2021). Ivanov *et al.* (2014) seminally defined the ripple effect as a potential supply chain breakdown impacting all elements and enterprises in the network. Ripple effects are particularly manifest in global supply chains, in which trade flows occur between firms operating in developed and emerging markets (Sreedevi and Saranga, 2017; Bonadio *et al.*, 2021).

Pandemic affected global supply networks. Problems in global production hubs like Dongguan, Bangladesh, India and Pakistan have halted production of most developed countries' semi-finished components (UN Department of Economic and Social Affairs, 2021). Fiat Chrysler Automobiles NV, according to shareholder reports, stopped production at a car factory in Serbia in response to its inability to receive parts from China. Similarly, Xu *et al.* (2020) observed that air travel restrictions prevented specialists and technicians from visiting production facilities in India, Vietnam and China, producing challenges in the textile and apparel industry due to incapacity to regulate raw material quality. During the first coronavirus outbreak (2020, 1st trimester), ripple effects reduced trade flows between Asia, Europe and the USA, reducing China's export performance by 20.1% and Pakistan's by 61.3% (WTO, 2020).

Global companies employ emerging markets because raw materials, industrial processes and logistic services are cheaper (Alvarado-Vargas and Kelley, 2020). Kumar *et al.* (2017) argued that enterprises in emerging nations must constantly rethink and reinvent their export routes to remain competitive in developed markets. Avoiding ripple effects through any means is a mutual interest.

Several studies reveal the ways in which new technologies provide a vital vehicle for ensuring more efficient supply chains in any disruptive events (Saldanha *et al.*, 2015), as they facilitate the transfer of knowledge across corporate boundaries. Nevertheless, technologies in supply chain should be implemented in both developed and emerging markets to establish a win-win strategy for suppliers and other parties involved in any position of the supply processes (Scuotto *et al.*, 2017).

Digital platforms emerged as technological solutions to solve these problems (Hein *et al.*, 2020). They indeed simplify mediation and final transactions in digital arenas connecting buyers and sellers (Shree *et al.*, 2021) and enabling large-scale markets. Digital platforms allow anyone to remotely monitor raw materials, product progress and processed item localization (Evans and Schmalensee, 2016). The most important feature of digital platforms is that they contain a large pool of suppliers, forming a real ecosystem in which economic exchange and knowledge can be developed across markets (Selander *et al.*, 2013).

Balakrishnan and Ramanathan (2021) found that digital platforms can improve demand planning, production capacity evaluation, distribution optimization and post-disruption adaptation. Ahmed *et al.* (2022) said information exchange and identifying new suppliers might ensure developed country procurement. Caputo *et al.* (2022) found that investments in digital platforms positively correlated with enhanced return on sales for small and medium enterprises (SMEs) in emerging markets as they allowed SMEs to strengthen distribution networks.

Although supply chains disruption has been extensively researched (Blackhurst *et al.*, 2005; Ivanov and Dolgui, 2021), scholars have thus far scarcely focused on the importance of technologies when reacting to disruptive events (Marley *et al.*, 2014). Further, digital platforms have mostly been studied in developed countries (Ahmed *et al.*, 2022). Digital platforms are in fact largely fabricated in developed countries, where a specific culture

around their use already exists (Abílio *et al.*, 2021). Gomez-Morantes *et al.* (2022), in this vein, argued that *the bigger picture* about digital platforms in emerging nations is overly restricted as pertinent literature neglected the role of these technologies in transnational supply chains extending to such contexts. Building on the above, Hein *et al.* (2020) recommended future research on digital platform ecosystems to examine the interrelation between internal digital platform the ecosystem.

This article consistently aims at bridging gaps concerning supply chains resilience in emerging and developed markets by highlighting the importance of digital platforms (Büyükoğkan and Göçer, 2018). According to Stank *et al.* (2001), when supply chains actors work together, they lower overall costs and improve service quality. However, there is a paucity of evidence and understanding in regards to how digital platforms increase the performance of the global supply chain network, and how they might help us to avoid future disruptions (Scuotto *et al.*, 2017). Particularly, the investigation will attempt to identify the drivers compelling firms in developed countries to establish digital platforms, the motives encouraging enterprises in emerging countries to adopt them and the potential expectations and side consequences of creating a digital ecosystem. Under these assumptions, our research questions are:

- RQ1. Why are digital platforms created by businesses in developed countries, and how are they adopted in emerging markets?
- RQ2. How do digital platforms help businesses to ensure a resilient supply chain between developed and developing countries during disruptive events?

The paper is organized as follows. Section 2 comprises the theoretical background on the role of digital platforms in enhancing the transnational relationship in global supply chain. Section 3 will present multiple case studies on the adoption of digital platforms in developed and emerging market. In the final sections, then, findings theoretical contributions and conclusions are discussed.

## 2. Theoretical background

### 2.1 Enhancing the role of digital platforms in supply chain management chain

Digital platforms are technological intermediaries allowing companies to cross territorial boundaries and collaborate with international players to create appropriate business networks (Shree *et al.*, 2021). Extent research has shown that digital platforms succeed in connecting customers and suppliers, facilitating negotiation and creating large scale efficient marketplaces (Kalia and Paul, 2021). Generally, platforms create a digital environment in which heterogeneous businesses interact electronically to identify potential partners (Dell'Era *et al.*, 2021).

Digital platforms have mostly been explored with a business to customer (B2C) focus, setting out the benefits that customers could gain from the availability of multiple sellers (Peltier *et al.*, 2020). This is striking, considering the strong connection between platforms and supply chain's objectives (Trabucchi *et al.*, 2020). According to Evans and Schmalensee (2016), some of the main benefits of using platforms in supply chain management are reduced transaction costs, increased transparency and information sharing. To access platforms, companies are required to provide most of their corporate information, along with detailed characteristics or charts about their products (Wallbach *et al.*, 2019). ELEMICA platform serves as a good example of this phenomenon (Tan *et al.*, 2015). To access this specific platform, all businesses are indeed required to provide reports on their current turnaround, their average delivery time and delays, their own supplier network, current customers' feedback and meticulous corporate data. Companies can then collect a significant amount of

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data and ideas that generate opportunities for supply chain integration through these platforms (Hahn, 2020). Thus, platforms allow companies to cross their borders to achieve global supply chain objectives, which may offer many significant advantages for international customers, including access to diverse sources of knowledge and innovation, access to new customers and materials and cost advantages due to economic labor (Fawcett *et al.*, 2008; Myers *et al.*, 2008).

Some of the most attractive locations to look after suppliers are nonetheless in emerging markets, which are characterized by companies and governments willing to attract customers from developed countries (Arnold and Quelch, 1998; Cavusgil *et al.*, 2012; Ahmed *et al.*, 2021). As such, emerging markets have become integral to global supply chain. However, as upstream suppliers in global supply chain, emerging markets may encounter greater risks in times of uncertainty (Christopher and Lee, 2004; Sreedevi and Saranga, 2017). Restrictions related to the recent pandemic, such as limitations on travel and the inability to verify the quality of raw materials in person, have accelerated the instability of global supply chain resulting in demand and supply shocks. Businesses through the worlds then now require new, strategic and tech-savvy solutions (Xu *et al.*, 2020). Accordingly, digital platforms could help developed country enterprises maintain supply chain management with emerging market. Integration through technologies between developed and emerging countries is in fact needed to lessen demand and supply shock regardless of negative market conditions (Ahmed *et al.*, 2020, 2021), to the benefit of the both sides.

Some studies have focused on how the use of technology can shape transnational relationships (Scuotto *et al.*, 2017) or how advanced technologies, such as big data, can help create value-added partnerships (Song *et al.*, 2021). Rai *et al.* (2006) demonstrated how a digital platform could play a critical role in global supply chain management. Digital platforms can provide information flow integration, ease physical flows of products and help in the management of financial flows. However, this research stream falls short in its exploration of the mechanisms pertaining to how developed countries' firms engage with raw materials and semi-finished producers from emerging markets. Specifically, it has neglected to consider the context-specific differences between emerging and developed markets' businesses embedded in a global supply chain, thus failing in establishing a clear understanding of the barriers experienced during the initial adoption of digital platforms. Following this perspective, there is a need to establish how these systems could be made manifest in developed countries, while finding applications in emerging countries. Given the strong interdependence between these two realities, we cannot settle for solutions that favor only one side of demand, while excluding the other; rather, research should find win-win opportunities. For example, modern digital platform implementation should overcome traditional problems, such as adoption fatigue on one side, lack of data integration, loss of control and regulation risks (Wong *et al.*, 2020). The implementation of a digital platform has to guarantee supply chain data integration and information connectivity (Dolgui *et al.*, 2020). Adopting a digital platform should allow companies to improve their visibility, their degree of collaboration and their coordination with suppliers, enabling them to respond strategically in the face of unexpected events (Wallbach *et al.*, 2019; Mancha and Gordon, 2021).

In respect to the success of digital platforms, Gomez-Morantes *et al.* (2022) stated that network effect depends on adoptability, which implies that the more producers and customers join the network, the more will be the value obtainable through the platform. Vice versa, slow rates of adoption will typically lead to platform's failure to reach a critical mass and generate beneficial impacts either in developed or emerging markets (Bonina *et al.*, 2021).

Digital platforms could thus emerge as win-win solutions for both developed markets and emerging economies. Through the platform, upstream suppliers can communicate and share the characteristics of their semi-finished products, allowing downstream companies to remotely verify the quality of these materials (Papetti *et al.*, 2019).

The development of digital platforms in supply chain management from advanced markets side can be achieved in two ways: extending the functionality of the enterprise resource planning (ERP) system with additional modules to develop an internal modular digital platform or choosing an external digital platform (Gawer and Cusumano, 2014). Many businesses are already using an ERP to manage their supply chain. This system integrates all of the organization’s activities, such as inventory management, order placement and financial reports, for day-to-day resource planning and execution (Umble *et al.*, 2003). Enterprises could extend ERP functionality through technologies such as block chain, artificial intelligence and Internet of things, thus gaining end-to-end supply chain visibility, cost and performance control and material quality (Perboli *et al.*, 2018). Extending the functionality of an ERP system enables the development of a true digital platform, in which the manufacturing company has full control over its suppliers, becoming the primary orchestrator. As a result, the orchestrator will grant its suppliers access to new modules, reducing costs for these emerging companies and developing their partnerships.

To improve the supply chain, companies may also decide to integrate an external digital platform into their processes (Gawer and Cusumano, 2014). By relying on external orchestrators, both developed and emerging companies are expected to charge a fee to enable them to benefit from the platform’s network. Depending on business specifics, enterprises may decide to move in different directions. On the one hand, the internal platform allows manufacturing companies to keep working with their usual suppliers, but with greater traceability. In addition to this, it is possible to track subcontractors through the internal platform by reaching a broad level of networks and relationships (Perboli *et al.*, 2018). This solution significantly reduces investments for suppliers in emerging markets, acting as a win-win and end-to-end approach. On the other hand, external platforms could be integrated into supply chain management when there is a requirement for certain aspects of logistics to be monitored without the stringent need to collaborate with a known pool of suppliers (Khan and Yu, 2019). Moreover, while in the internal digital platform, the major investment is borne by the manufacturing company. In the external platform, the emerging supplier must invest both financial resources and knowledge.

Anyway, Gomez-Morantes *et al.* (2022) observed three broad domains of factors that have been observed to shape platform adoption in either the contexts. The first is micro-level, which includes individual user considerations include platform incentives and rewards. Thus, the main facilitators concerning platform adoption are included in this domain. The second is meso-level, which are systemic factors related to the players who construct and utilize the platform, their relationships, and the rewards of using it. Benefits are thereby part of this domain. The third is macro-level, which is related to the context of platforms and explains the barriers. The concepts of these levels, including specific features related to emerging markets, are shown in Table 1:

Domains	Macro categories contained in the domain	Adoption features in literature	Developing countries specific features
Micro-level	Facilitators	Incentives/Competencies	Skills/Knowledge
Meso-level	Benefits	Business strategies/Actors relations	Instructional shortcoming/ Power inequalities
Macro-level	Barrier	Technology/Social aspects	Technology/Finance

**Table 1.**  
Key digital platforms  
dimensions and  
developing countries  
elements

**Source(s):** Adapted from Gomez-Morantes *et al.* (2022)

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Such a perspective is coherent with the Diffusion of Innovation (DOI) theory and the Technology-Organization-Environment Framework (TOE) (Rogers *et al.*, 2014; Tornatzky *et al.*, 1990). According to the former theory, innovation adoption benefits should overcome perceived threats and barriers. For example, the ability to monitor global supply flows and meet new suppliers is an advantage overcoming threats for developed countries' businesses. For emerging markets businesses, the ability to continue to trade with foreign countries overcomes any implementation difficulties. TOE, instead, posits that environmental pressures (such as the coronavirus pandemic and the resultant global distribution problems) and technological push (i.e. high-speed Internet availability) could shape the adoption of a technology by a business. In this study, technology aligns with behavioral control, or users' dexterity, to leverage digital platform adoption. Organizational variables describe internal digital platform availability and use. Environmental factors, then, involve market forces, competitive pressures, government laws, suppliers, vendors, trading partners and customers affect operational effectiveness, strategic positioning and proactive actions.

In sum, platforms enable the coordination of geographically dispersed firms, opening up new ways of building and leveraging economic momentum (Thomas *et al.*, 2014; Nambisan, 2017). Thus, through the platform, manufacturing firms and a multiplicity of suppliers located around the world can communicate and continue to trade economically while overcoming potential disruptions.

### *2.2 From digital platforms to digital ecosystems*

According to Autio and Thomas (2014), the concept of the ecosystem explicitly reveals interdependencies between organizations and their environment, providing an innovative view of co-evolution and value creation. Due to the increasing importance of inter and intra organizational relationships, strategic research has revealed a growing interest in creating and capturing value by transcending firm boundaries, including concepts such as business ecosystems (Adner, 2006; Baldwin, 2012). The business ecosystem encompasses all actors that are directly or indirectly involved in the co-creation of value (Frow *et al.*, 2016). Value co-creation then occurs when actors interact to produce new value, frequently by recombining existing resources. It's important to establish key roles and describe the value co-created by each (West *et al.*, 2018). Thus, the ecosystem is established as an economic community of interacting actors that influence each other through their activities (Koch and Windsperger, 2017; Jacobides *et al.*, 2018).

As a consequence of digital technologies and platform development, the focus has shifted from the ecosystem concept to the digital ecosystem. Selander *et al.* (2013) define a digital ecosystem as "a collective of firms that is interconnected by a common interest in the prosperity of a digital technology or digital platform". According to Jacobides *et al.* (2018), the platform ecosystem takes a "hub and spoke" form, with several peripheral enterprises connected to the central platform through shared technologies and/or technical standards. In connecting to the platform, different businesses can both generate complementary innovation and gain access to the platform's customers (Koch and Windsperger, 2017; Shipilov and Gawer, 2020). Digital platforms and ecosystems also transcend boundaries, locations and industries. Collaborative interactions among ecosystem members reflect and reinforce the co-specialization of members, many of whom are often located in different countries. Ecosystem-specific benefits could arise from shared intangible resources, such as members' reputations, members' relational resources and members' intellectual resources (Nambisan *et al.*, 2019). Using non-location resources allows companies to gain advantages over their competitors outside of the ecosystem.

Thus, with digital platforms, manufacturing companies operating in developed countries can create a digital relational network in an attempt to improve ideas, innovation and

competitive advantage (Pagani and Pardo, 2017). Moreover, the ecosystem strengthens the specialization of both developed and emerging enterprises (Scaringella and Radziwon, 2018). Platform-enabled ecosystems dramatically reduce coordination costs and become central to the growth strategies of companies in a wide range of industries. When functioning, ecosystems allow companies to create shared value (Zahra and Nambisan, 2011). However, the ecosystem has its risks, such as those pertaining to dependence on other companies. When value is created within a specific ecosystem driven by specific relationships, the risk of dependency increases (Adner, 2006), nonetheless, this aspect can be easily mitigated, as the digital ecosystem assumes coordination and integration between multiple businesses. Using a digital platform, manufacturing companies can develop a set of relationships with multiple emerging supplier companies, while mitigating dependencies and uncertainties (Faisal *et al.*, 2006). Thus, digital platforms facilitate relationships and drive the exploitation of emerging markets by creating a digital environment orientated toward continuous innovation and collaboration.

Building on the above, the ways in which internally developed digital platforms represent the key to create a transnational digital ecosystem will be explored through the analysis of eight cases. The authors aim to observe how this technological strategy could generate win-win outcomes for businesses in developed countries and emerging ones.

### 3. Method

#### 3.1 Research context

Eight cases were selected from the customer pool of a leading Italian IT solution-provider and consultant. The authors opted to rely on the contacts of the aforementioned IT consultant as the company has aided the engagement of several different businesses in the research (see Pratono, 2019). In the first stage of case identification, four Italian businesses facing some degree of uncertainty in their transnational supply chain management strategies were selected. All four of these businesses operated at the top of the fashion industry's global supply chain; i.e. they imported either the raw materials or semi-finished components from other emerging markets. Then, four cases from emerging countries were acknowledged. The authors then identified four relevant suppliers from emerging countries who were supplying the Italian companies. Four pairs of businesses (making a total of eight cases) were selected. Through these companies, the authors observed the phenomenon of digital platform adoption in supply chain management, both from the perspective of the buyers and one of the sellers. This approach has been deemed suitable for obtaining relevant insights on the target phenomenon, as the first four selected businesses asked the IT consultant to develop information and communications technology (ICT) in order to better monitor suppliers and maintain 24/7 contact with them. Consistently, the four suppliers in emerging countries were asked to adopt this technology to manage all transactions. In spite of the adoption of a convenience sampling procedure, in the end, the eight cases were deemed relevant to our research questions. They also offered the authors the opportunity to obtain generalizable results, as they represented four different and not necessarily interrelated supply chains.

All the selected businesses operate to a certain degree within the fashion industry. This occurrence is coherent with the peculiarities of the economic system of Tuscany. Indeed, according to IRPET (2021) data, the fashion, textile and leather goods industry represents about 35% of the exported goods of the region (in comparison to a 6.8% average from Italy). However, while the manufacturing process occurs in Tuscany, raw materials and semi-finished products often originate in emerging markets. For example, yarn used in the Prato's cluster for the production of woolen clothes and fast-fashion apparel mostly comes from China, India, Pakistan and Bangladesh. Crocodile, ostrich and other luxury leathers used in tannery-related productions originate from South-Africa, Mozambique and Madagascar.

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Then, cheaper components used in the fashion accessories industry (i.e. shirt buttons, screws, springs and laces) are often manufactured in Asian countries, as the cost of production for these items is prohibited by Italian manufacturing standards. Hence, a mutual dependence between businesses from developed countries and developing ones is present. Such a phenomenon is clearly observable when we consider how the trade of raw fashion materials and semi-finished products from developing countries to developed ones decreased by 13–32% (depending from the country) according to the UN Conference on Trade and Development (UNCTAD, 2020) as a consequence of shipping problems, forced lockdowns and deriving re-shoring processes.

### 3.2 Methodology

The objective of the research is exploratory (Eisenhardt, 1989), as literature on digital platforms for global supply chain management is quite limited, with only a few exceptions (see Sukhor *et al.*, 2020). A comparison between multiple case studies from different contexts has therefore been deemed a suitable methodological approach (Ridder, 2017). According to Yin (1993), multiple case study analysis allows respondents to offer “how” and “why” insights on a specific phenomenon. This methodological approach is likewise appropriate for cross-case or cross-context comparisons (Chiesa and Frattini, 2009). Multiple case studies allowed us to better validate and strengthen results that might otherwise only be obtained through a single case study (within-case analysis) with a cross-case comparison (between-case analysis; Eisenhardt and Graebner, 2007). The emerging evidence collected began to converge as a consequence of the use of such a number of cases. Thus, this approach allowed us to achieve theoretical saturation (Eisenhardt, 1989).

Data collection started on October 15, 2021 and ended on November 4, 2021. In total, 16 interviews from key informants were jointly collected by researchers (usually two for each case). One researcher attended all interviews to ensure internal consistency. Of these, nine were conducted in person with managers and directors working in one of the Italian businesses, and seven were collected through online interviews with managers located in an emerging country. As the phenomenon is two-sided (one part occurs in Italy and one part occurs in a developing country), it was deemed necessary to consider both perspectives in order to gather all of the required information. Additional information, made up of reports from the businesses, corporate websites or social media pages, data from ICT consultants and other qualitative sources, such as newspapers, were included in the analysis in order to obtain a full overview. The qualitative research was persistently reinforced by the theoretical concepts emerging from the literature. Accordingly, the authors consciously endeavored to recognize appropriate instances from the collected data (Siggelkow, 2007). Undeniably, the data stemming from interviews with key informants of the selected cases provided real-world indications; yet contents deemed fundamental to developing a final framework had to be revised and integrated time-to-time, as the analysis moved on from empirical findings and conceptual maturity, in line with the so-called reflective spiral approach (Finch, 2002).

Data concerning cases, interviews and additional sources can be seen in Tables 2 and 3.

Semi-structured interviews were selected as a method by the research team. Semi-structured interviews allow the interviewers to start the interview with a specific topic/question. However, this approach allows the informant to span across different topics and provide additional information spontaneously (Rowley, 2012). Although the interview protocol during data collection was somehow fluid in order to take advantage of emerging themes, some common enquiries were always tackled. In this regard, some of the selected topics were more general (i.e. supply chain situation before the pandemic) while the others

derived strictly from existing findings on digital platforms' use in supply chain management or in international management. To set out the starting questions, the authors carefully reviewed existing literature on benefits and barriers concerning digital platform implementation (Ivanov *et al.*, 2014; Wallbach *et al.*, 2019; Trabucchi and Buganza, 2020). In particular, on the one hand the authors identified the macro areas defined by Rogers *et al.* (2014) postulates of DOI and the assumptions of Tornatzky *et al.* (1990) concerning the TOE. Internal and external factors influencing organizational technological adoption and implementation were thereby considered. On the other hand, based on the work of Gomez-Morantes *et al.* (2022), the three macro domains related to platforms adoption in supply chain management were considered. The interview protocol is summarized in Table 4.

### 3.3 Coding analysis procedure

The authors kept a research log to progressively trace any particularly relevant insights that emerged during the interviews. The research log was examined by the authors time-by-time and was persistently revised to ensure it detected progressively emerging themes, to the point where no new relevant insights emerged (i.e. theoretical saturation; Chiesa and Frattini, 2007). The use of a research log also allowed us to identify the common preliminary points stressed by all key informants. As fundamental information about the use of digital platforms in supply chain management were collected, these were related to existing theoretical evidence in an attempt to better conceptualize the phenomena (Finch, 2002).

Alongside the research log, the interviews were recorded on Microsoft Teams and were transcribed. The original transcription was then read, and several follow-up notes were added by the authors to highlight the most important information. Using the initial transcription of the recorded interviews (about 70 pages), the authors began a cut-and-paste procedure to identify the main insights and the most common replies (which represented the codes). These selected codes formed the basis for the within-case specific analysis. Information about individual cases were then drawn at this point of the research. Information from secondary sources was then axial coded in order to aggregate them with the main ones (Strauss and Corbin, 1990). The results were pooled by the authors. The diverse highlights individually identified by the authors were compared, consistently with Finch's (2002) protocol.

Finally, the codes were evaluated again in light of extant literature on the topic. A final list of common themes – which represent the sum of the most commonly emerging nodes from the within-case analysis – was created.

At this point, the researchers started to compare the themes emerging from the individual cases between each other, enabling them to ascertain the macro-categories commonly shared across the eight different cases. Macro-categories – or second order concepts – represent the aggregation of themes emerging from single cases.

Business	Suppliers
Alpha	Beta
Florence, Italy	Bangkok, Thailand
Gama	Delta
Prato, Italy	Lahore, Pakistan
Epsilon	Zeta
Arezzo, Italy	Guangzhou (ROC)
Eta	Theta,
Scandicci (Italy)	Cape town

Source(s): Authors' elaboration

**Table 2.**  
Headquarter of  
selected cases

**Table 3.**  
Information about the  
selected cases

Name of the business (acronym) <i>Pairs</i>	Industry (supply chain)	Headquarters	Size	Turnaround	Principal emerging countries where part of supply chain is located (for Italian businesses)	Direct sources (interviews)	Date and duration of the interviews	Secondary sources
1) alpha-beta 2) gamma-delta 3) epsilon-zeta 4) eta-theta								
Alpha	Metal and Plastic Hardware for Fashion Industry ( <i>High-End Fashion and Luxury</i> )	Florence (IT)	50–100 Employees	€40m (Approx.)	China, Taiwan, Thailand, Malaysia	1) CEO 2) Supply Chain Analyst 3) Chief Technology Officer	October 15, 2021; 1 h 45 min October 15, 2021; 48 min October 15, 2021; 1 h 25 min	1) Corporate Website 2) Social Media Page 3) Reports from IT Consultant 4) Accounting Documents 1) Corporate Website
Beta	Metal and Plastic Hardware for Fashion Industry ( <i>Key Supplier of Alpha</i> )	Bangkok (TH)	200–300 Employees	€10m (Approx.)	/	1) CEO 2) Shipping Manager	October 18, 2021; 35 min October 18, 2021; 25 min	1) Corporate Website 1) Corporate Website
Gamma	Woolen clothes ( <i>Fast-Fashion Apparel</i> )	Prato (IT)	100–150 Employees	€25m (Approx.)	China, Pakistan, India, Bangladesh	1) Managing Director 2) Supply Chain Manager	October 20, 2021; 2 h 03 min October 20, 2021; 1 h 12 min	1) Corporate Website 2) B2C Website 3) Chamber of Commerce Reports 4) Accounting Documents 1) Corporate Website
Delta	Yarn ( <i>Key Suppliers of Gamma</i> )	Lahore (PK)	300–400 Employees	€20m (Approx.)	/	1) Export Manager 2) Quality Manager	October 21, 2021; 1 h 30 min October 21, 2021; 44 min	1) Corporate Website

(continued)

Name of the business (acronym) <i>Pairs</i>	Industry (supply chain)	Headquarters	Size	Turnaround	Principal emerging countries where part of supply chain is located (for Italian businesses)	Direct sources (interviews)	Date and duration of the interviews	Secondary sources
Epsilon 1) alpha-beta 2) gamma-delta 3) epsilon-zeta 4) eta-theta	Jewelry ( <i>High-End Jewel and Watches</i> )	Arezzo (IT)	25-50 Employees	€5m (Approx.)	China, Vietnam, Thailand	1) CEO 2) Import Manager	October 25, 2021; 2 h 20 min October 26, 2021; 1 h 10 min	1) Corporate Website 2) Social Media Page 3) Accounting Documents 1) LinkedIn Page
Zeta	Raw Material and Semi-Finished Products for Watches and Jewelry ( <i>Key suppliers of Epsilon</i> )	Guangzhou (ROC)	100-150 Employees	€10m (Approx.)	/	1) Account Manager of key supplier 2) Production Manager	October 26, 2021; 28 min October 26, 2021; 45 min	1) Corporate Website 1) LinkedIn Page
Eta	Fashion Accessories Plating and Garments, Including Precious Stones ( <i>High-End Fashion and Luxury</i> )	Scandicci (IT)	100-150 Employees	€20m (Approx.)	South-Africa, Angola, Namibia, Indonesia	1) CEO 2) Senior Supply Chain Analyst	November 3, 2021; 2 h 05 min November 3, 2021; 1 h 10 min	1) Corporate Website 2) Accounting Documents 3) Public Reports for Stakeholders
Theta	Precious Stones ( <i>Key Supplier of Eta</i> )	Cape Town (ZA)	20-50 Employees	€15m (Approx.)	/	1) Export Manager of Key Supplier 2) Junior Sales Manager	November 4, 2021; 48 min November 4, 2021; 16 min	1) Corporate Website

Source(s): Authors' elaboration

Importance of digital platforms in SC

Table 3.

**Table 4.**  
Qualitative interview  
protocols

Macro- topic	Supply chain situation before coronavirus pandemic	Problems and disruption caused by coronavirus pandemic to supply chain	Solutions to coronavirus- related problems	Resistance to solution	Benefits of digital platform integration in global supply chain
Starting Questions	<ul style="list-style-type: none"> <li>- How did your business manage global supply chain problems before the coronavirus pandemic (i.e. import or export problems)?</li> </ul>	<ul style="list-style-type: none"> <li>- Did the coronavirus pandemic alter communication with your business suppliers or customers?</li> <li>- Did the coronavirus pandemic alter the quality of shipped products?</li> <li>- Did the coronavirus pandemic prevent visits to your business suppliers or visits by your customers?</li> <li>- Did the coronavirus pandemic increase lead time?</li> </ul>	<ul style="list-style-type: none"> <li>- Which idea did you develop to cope with coronavirus-related problems?</li> <li>- How did you come up with this idea?</li> <li>- How did you evaluate its usefulness and technical feasibility?</li> </ul>	<ul style="list-style-type: none"> <li>- Did someone from your organization resist the new technological solution?</li> <li>- Why did employees try to put up obstacles with regard to the implementation of the new technology?</li> <li>- Which were the main obstacles for the implementation of the solution?</li> <li>- How did you manage data sharing?</li> </ul>	<ul style="list-style-type: none"> <li>- Did your business experience any cost-benefits from technology implementation?</li> <li>- Did your business experience any quality-related benefits from technology implementation?</li> <li>- Did your business experience any improvements in term of lead-time?</li> <li>- In your opinion, is your current supply chain more resilient?</li> </ul>
Sources	N/A	<p>Ivanov <i>et al.</i> (2014), Bonadio <i>et al.</i> (2021)</p>	<p>El Baz and Ruel (2021), Li <i>et al.</i> (2021)</p>	<p>Boudreau (2010), Scuotto <i>et al.</i> (2017), Manchia and Gordon (2021)</p>	<p>Wallbach <i>et al.</i> (2019), Trabucchi and Buganza (2020), Trabucchi <i>et al.</i> (2020)</p>

**Source(s):** Authors' elaboration

#### 4. Results

Figure 1 presents the results of the multiple case study analysis. The main themes resulting from the identified codes and principal macro-categories emerged. The most relevant quotes from respondents associated with themes and macro-categories were also included.

The interviews allowed us to better understand the main topics underpinning the adoption of digital platforms in global supply chain management. Contextual factors, main resistances and benefits related to the implementation of ICT emerged. While convergence on

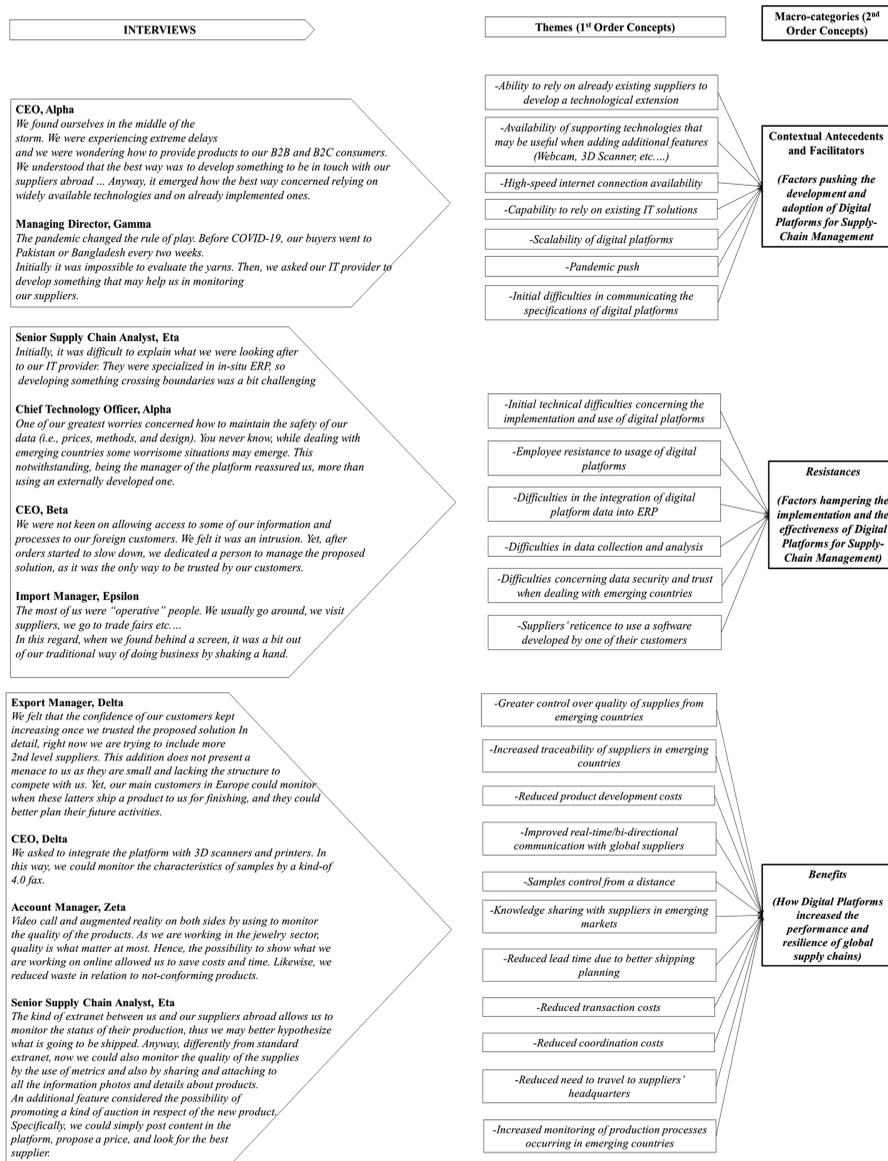


Figure 1. Result of the coding analysis: interviews, themes and macro-categories

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these three topics was identified, individual differences between businesses operating in developed countries and emerging countries were considered. These differences will be discussed in the following sections.

#### *4.1 Contextual factors underpinning the adoption of digital platforms in global supply chain management and facilitators*

According to our respondents, the coronavirus pandemic was the main driving force in the development and adoption of digital platforms. If it had not been for the pandemic, most businesses would potentially have neglected these tools and continued to run their operation as usual. Environmental pressures thus made up the lion's share of the factors pushing the development and the adoption of technology (Shree *et al.*, 2021). The impossibility of monitoring in presence the development of new products/samples and the advancement of the production processes was then the main motivation for Italian businesses. The availability of technological infrastructures (i.e. high-speed Internet connection, webcam, mobile devices, 3D scanners, 3D printers, cloud computing and cloud sharing) likewise acted as an enacting element. In fact, the ability to integrate these technological applications within the functions of the digital platforms provided the opportunity to better share different information.

The additional reliance on widely diffused IT tools and plug-ins allowed for further customization of the solutions, while maintaining cross-country usability and ease of use (i.e. by relying on Microsoft-originated plug-ins). This possibility increased the interoperability of the developed technologies.

These two findings are coherent with extant research on TOE frameworks and digital platform adoption. Technological availability, knowledge and environmental factors push organizations to adopt innovative solutions.

Other factors stimulating this interest toward internally developed digital platforms include the potential of scaling-up existing tools (De Reuver *et al.*, 2018). Such a strategic solution allowed us, first of all, to reduce development costs and rely on the same IT solutions as suppliers (which originally developed the initial ERP). Second, the scaling-up of an existing technology may exploit existing capabilities spanning across the organization. Employees' current IT competences could be used to enact the new features of the digital platform. Likewise, employees could perceive digital technology to be more useful if they already understand some of its functions (Li *et al.*, 2018). Finally, internally developed solutions provide more comprehensive control over shared data and participants, avoiding data breaches. This is particularly true with regard to the Italian business side, as these businesses were acting as orchestrators of the digital platforms, selecting the amount of shared data visible to any involved party.

Internally developed digital platforms therefore emerged as a solution for global supply chain management amidst a crisis (De Reuver *et al.*, 2018). In fact, through the use of these technological tools, the potential to quickly reply to interruptions in communication and collaboration became a possibility. However, these tools could also be easily implemented due to existing competences spanning both businesses in developed and emerging countries. Additionally, businesses in emerging countries observed a benefit in the fact that they were not required to invest money in the development of the technology.

#### *4.2 Principal resistances to digital platforms adoption*

Several instances of resistance against the adoption of internally developed digital platforms emerged.

To what concern the businesses operating in developed countries, the principal resistance concerned technical difficulties and employees' skepticism (Fitzgerald *et al.*, 2014). In respect

of this, employees on the one hand, perceived the new technology to be a burden on top of their current work. While the platform was sharing the same basic characteristics of existing tools, their individual workload increased as a consequence of the need to enter and monitor data from suppliers in developing countries. On the other hand, most employees with import management duties were not comfortable in the initial stages when it came to managing personal relationships through online platforms. Many of them usually managed supply chain activities with developing countries by visiting their plants, negotiating directly with managers and planning shipments *in situ*. Likewise, they were actively involved in product development while on their business trips. Therefore, such a change represented a kind of shock for them (Mokyr *et al.*, 2015).

Another great resistance experienced by businesses operating in developed countries concerned data sharing (Ndou, 2004). While it may seem counterintuitive, as these businesses were the ones promoting the development of the platform, strict European privacy regulations (i.e. General Data Protection Regulation (GDPR) were viewed as a concern for businesses. This phenomenon is particularly true if we consider that the opening of the supply chain may involve the sharing of data, such as price, production procedures and corporate data. Additional concerns were linked to the risk of sharing too much information about products with suppliers, as well as the related risk of counterfeiting (Marucheck *et al.*, 2011). This concern was quickly dismissed by most of our businesses due to the existing trust between partners and the existence of somewhat symbiotic relationships in the supply chain.

For businesses in emerging countries, the principal limitations were linked to lack of trust in an externally developed platform, related lack of control and the absence of a skilled workforce (Mandják *et al.*, 2019). The risk of loss of control was linked to information and supply chain, as some businesses initially felt they had lost touch with the facilities needed to ship their product at their convenience. Similarly, as more suppliers become present in the platform, they initially fear that businesses from Europe may arbitrarily decide to replace them. Trust and collaboration were again vital when solving these problems. Furthermore, the lack of skilled workforce was dealt with through the inclusion of new staff and ad-hoc training programs from businesses in developed countries.

#### *4.3 Benefits of digital platform adoption in global supply chain management*

The immediate effects of digital platform adoption were reported by businesses, both in developed and developing countries. All businesses described how these tools were effectively capable of solving problems related to in-presence collaboration and fragmented communications. Bi-directional communication through chats and the possibility of sharing technical information were, in fact, perceived to be beneficial for all the players involved. Consistently, other communication and data-sharing benefits followed.

First of all, product development costs decreased. The authors observed that communication; the option to share information and technical sheets; the ability to monitor parameters from machineries connected to the Internet and the possibility of visually controlling the output through webcams all proved extremely useful for this scope.

Second, production has become more traceable for both sides. The sharing of information about production times and advancements allowed researchers to better plan shipments (i.e. it allowed us to implement something of a just-in-time approach with respect to deliveries). Additionally, the inclusion of the data about second-level suppliers allowed us to gather data about other players and better monitor the true origins of products and any eventual quality problems arising at different levels.

Consequently, a third benefit emerged: the ability to better monitor quality across the supply chain. The adoption of digital platforms allowed us to implement statistical quality control procedures for suppliers who were originally not providing this kind of service

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(Wong *et al.*, 2020). In addition, the integration of computer vision quality control in the platform provided specific data on most of the production batches.

Fourth, knowledge freely flowed between many more employees across all of the businesses. Where originally it was flowing only through a few subjects (i.e. export managers on the suppliers' side and import managers on the purchasers' side), now anyone accessing the platform can communicate with a counterpart, thus facilitating the sharing of production methods, practices and new ways to improve how a product is created (Wong *et al.*, 2020).

Finally, overall reductions have been observed through transaction costs and coordination costs. Through our dashboards, it is possible to better observe any potential matter concerning production.

#### *4.4 Remarks and conceptual framework*

Building on the aforementioned results, we can see that managers experiencing problems with global supply chain management should consider the internal development of digital platforms. These tools allow managers to trace production, reduce costs and obtain far more data about their suppliers. The adoption of digital platforms, however, comes at a cost (i.e. the opening of the supply chain). However, this may facilitate the creation of a digital ecosystem in which information and knowledge freely flow.

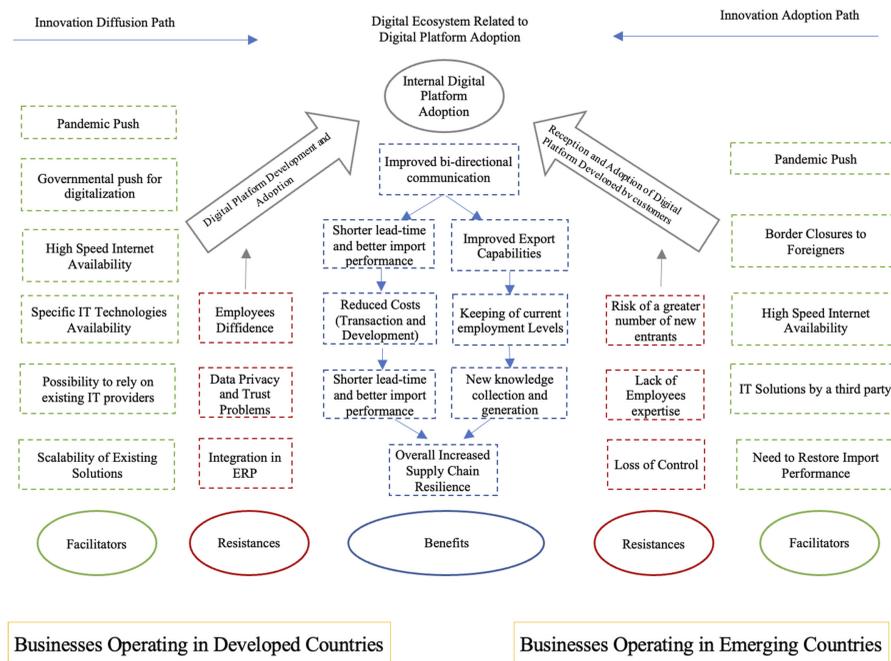
Just as developing businesses could act as the orchestrators of these systems, managers could choose whether an individual should be included or not, and which information might be shared. Managers should therefore complete a due diligence review of their supply chain, consider the most reliable and trusted suppliers and discuss prospective benefits with them. In particular, digital platforms could contribute to reuniting severed supply chains across the world through limited investments, i.e. by mocking the possibility of visiting distant suppliers or customers and directly interacting with each other. The process underpinning the adoption of digital platforms on both sides is outlined in [Figure 2](#).

## **5. Theoretical and managerial implications**

This research contributes to the emerging stream of research on digital platforms in supply chain management within the context of transnational relationships. In particular, the findings shed light on the importance of these tools in ensuring global supply chain continuity. Digital platforms can form ecosystems and could potentially allow companies in Europe or North America to continue ordering raw materials and semi-finished goods from suppliers in emerging countries, even during lockdowns and travel bans. Through information transparency, reduced transaction costs and quality standards could also be ensured, even in online environments. To our best knowledge, this topic has been insufficiently explored, as most research has focused primarily on externally developed platforms (e.g. Alibaba Marketplace) and not internally developed ones (Trabucchi and Buganza, 2020). Similarly, platforms have been explored primarily by research focused on their effects on supply chain efficiency and price negotiation in developed markets. However, this research seeks to offer a dual perspective by looking at their importance in developing countries as well.

The existing literature has been expanded by considering the effects of digital platforms on all stakeholders, the export performance of firms in emerging markets and technological development. Indeed, supply chains altered by COVID-19 pandemic were at risk of being disrupted, having had a great impact on employment and social development in emerging countries (Mollenkopf *et al.*, 2020). However, through digital platforms, we have observed how they can continue to communicate and trade with key foreign customers. The development of a comprehensive digital ecosystem has had an additional effect on emerging

# Importance of digital platforms in SC



**Figure 2.** Explicative framework

Source(s): Authors' elaboration

markets, namely the sharing of new knowledge. In fact, the continuous interaction between them and European companies has enabled employees in emerging countries to gather new knowledge and strategies to improve production processes and planning, thus increasing the quality of their products and their overall competitiveness. The adoption of platforms then ensures not only operations' continuance but also knowledge transfer between developed and emerging countries.

This research also observed the usefulness of the DOI-TOE framework in evaluating the development and adoption processes of digital platforms. In particular, it was observed how common technological trajectories converge toward the adoption of a specific technology which may generate benefits in any context.

Following our results, managerial implication for companies operating in both developed and emerging markets may be drawn; both the typologies of companies have in fact perceived a multitude of benefits that positively impact upon the adoption of digital platforms in supply chain management. Aspects such as reduced transaction costs, improved transparency and bilateral communication, new knowledge creation and greater supply chain resilience are all relative advantages associated with the adoption of digital platforms. According to several pieces of research studying the effects of DOI theory (Rogers *et al.*, 2014), perceived relative advantages associated with a new technology favor its adoption. Despite the perception of some resistance, such as employee diffidence, privacy and trust issues and loss of employee control and experience, the relative benefits coupled with the platform outweigh its perceived resistance. When the advantages exceed possible barriers, companies will be more willing to adopt digital platforms (Shree *et al.*, 2021). A pivotal conclusion emerging from the interview results pertained to facilitators. The external environment in

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which companies operate can positively facilitate the adoption of innovation. Following the TOE framework perspective, existing regulations, the need to respond to times of crisis and the availability of infrastructure all foster the adoption of new technologies in both developed and emerging countries. In practice, then, those insights may be turned into several principal guidelines for managers. The first one concern the need to develop perpetual training practices aiming at keeping employees updated on digital trends which may emerge, to overcome their resistance. Such an approach will overall increase organizational flexibility amidst complex situations, when adopting a new technology may make the difference between demise and success. The second concerns the need for any business to invest in cybersecurity mechanisms. These information-leaking barriers, indeed, may help to adopt a new technology while preventing sensitive information outbreaks. Third, it is possible to suggest managers (specifically the ones from developed countries businesses) to cross-check their suppliers in emerging markets not only for the prices of their offering but also for their adaptability to macro-shocks and their technological readiness.

These findings confirm the appropriateness of our research and expand our knowledge with regard to the benefits, barriers and external facilitators that influence the adoption of digital platforms in transactional relationships. These platforms can be easily integrated by firms in emerging markets with a low adoption cost, as they do not require significant structural investment. Likewise, digital platforms may be created by developed markets with low investments as there are many government incentives promoting the development of advanced supply management tools (i.e. Software Development or Industry I4.0 tax credits in the EU). Hereby, in the light of the several various benefits highlighted in the interviews, both developed and emerging market enterprises can improve supply chain resilience through this tool.

## **6. Conclusions, limitations and suggestions for future research**

This study sought to assess the effects of digital platforms on global supply chain functioning and resilience in times of crisis. The findings corroborate how these tools may represent a cutting edge in global supply chain effectiveness, as they allow managers to plan shipments strategically. Likewise, digital platforms allow bidirectional communication and information sharing, which can generate cost reductions and increase quality control.

The findings show that digital platforms may represent a strategic tool for the development of affected industries in emerging countries, as they may have a significant effect on their export performance and their distribution capacity.

This research is limited in some ways. First of all, it is based on a qualitative methodology. As such, the findings need to be corroborated by a quantitative exploration. Second, our starting point is represented by businesses operating in developed countries, and we extrapolated the implications for emerging countries. Third, the research focused only on internally developed digital platforms.

Building on these limitations, future research should better explore the importance of digital platforms in similar contexts, by using quantitative methodologies and considering externally developed platforms. Moreover, future studies could better explore how and whether the patterns of platform adoption change across global supply chains in different industries.

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