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A New Challenge of Supply Chain in Emergency Response Management: A Case Study of Covid-19 Pandemic

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Abstract

Many argue that the Covid-19 pandemic gives a new challenge for emergency response management. This article investigates some challenges faced by the supply chain in 36 academic journals of logistics and supply chain. We found eight relevant articles related to it and the Covid-19 pandemic. The pandemic brings about ghost demand, in-flight service change, public-private partnership, virtualization, and general safety. The article recommends the importance of chain supply modernization, in the form of blockchain technology, mobile service technology, and business intelligence technology.

Keywords: *Logistics, supply chain management, blockchain technology, mobile service technology, business intelligence technology*

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Introduction

The Covid-19 pandemic has been going on for almost a year and has a huge health impact on the world. According to real-time Worldometer, by 24 November 2020, 59,570,462 people have been infected with this disease, with 1,403,111 of them died (Worldometers, 2020). Scientists have recognized during this time, six strains of the Covid-19 virus (Mercatelli & Giorgi, 2020) and identified the vulnerable groups from the tendency of their blood clotting (Malas et al., 2020). In general, physical distancing is the best way to stop the transmission of (Tupper, Boury, Yerlanov, & Colijn, 2020), not only Covid-19 but also other endemic contagious diseases (Baker et al., 2020).

The 2020 year-long pandemic has disrupted the supply chain and logistics system. Both medicinal and general product supply chains are hampered, which affects the price and availability (Mahajan & Tomar, 2020). The fast spread is unanticipated by the supply chain and alters the main issue from profit and sustainability into business survival (Ivanov & Das, 2020; Ivanov & Dolgui, 2020). The literature on the supply chain is

behindhand in responding to the research needs, unlike the literature on health (Al-Mansour & Al-Ajmi, 2020).

We explore the phenomena in the supply chain and logistics in this Covid-19 pandemic situation. This paper contributes to the previous studies. It provides comprehensive reviews on the issues faced by the supply chain in the pandemic era because it is carried out a year after the pandemic began. It also presents a general overview of the approach that theoretically aims at emergency mitigation and its effectiveness in the current real pandemic state. Besides, this paper also compares various conditions of the supply chain and their new challenges.

The rest of this paper is arranged in the following way. The second part reviews previous studies in the management of the supply chain in the pandemic era, while the third elaborates on our methods. Part four uses the methodology to gather articles related to the pandemic supply chain. The fifth part discusses various results of the review concerning the challenges faced by the supply chain in the Covid-19 era and concludes it (Hayati, Suroso, & Kaukab, 2020).

Review of the literature

Studies in the chain supply and logistics management have long accounted for various forms of pandemic disturbances. They include the need to address diagnostic challenges (Kelly-Cirino et al., 2019), urgent needs for personal protective equipment (Patel et al., 2017), increases of test access and the need to add antiviral production capacity (Jamieson & Kellerman, 2016), disruption to supply chain integrity including criminal destruction (Nayyar et al., 2019), the need for increasing public supply visibility to prevent extravagance (Li, Swann, & Keskinocak, 2018), and the need to accelerate antiviral administration (Koonin & Patel, 2018). Studies conducted before the pandemichave warned us that it can affect the regulatory process competing with the new drug validation procedure in normal time (Ventola, 2011). The demand might go beyond expectation or production capacity due to the pandemic (Gu, Wertheimer, Brown, & Shaya, 2011). The previous studies also highlight the potential of new clinical practice demand that ignites political instability (Awad, Al-Zu'bi, & Abdallah, 2016).

Methodology

We made a systematic search on the Scimago Journal Rankings site to seek articles in supply chain and logistics. "Supply chain" or "logistics" is the keyword used in it to identify all journals. Conference proceedings are excluded as they are for specific years instead of the year 2020. The journal search was on 24 November 2020. All of the available journals are eligible for screening.

Journal screening was carried out by visiting the websites of each of the journal to identify the articles discussing chain supply and logistics related to the Covid-19

pandemic, which are published only in 2020. The abstracts found are then screened to find the articles that identify the challenges faced by chain supply and logistics in the pandemic era for the literature review. When the abstract does not provide the information, the full text is examined.

The data that are collected from the identified studies include their detailed information (name of the authors, study site country, background) and the factors of challenges. Therefore, the outputs of each of the studies are the challenges faced by supply chain and logistics during the pandemic. We present them in a table.

Results

Journal search using the keywords "supply chain" yielded 15 journals, while "logistics" resulted in 21 journals. However, there are only five of them include the articles on the Covid-19 pandemic. We managed to gain eight from them, which we included in the literature reviews (Amankwah-Amoah, 2020; Choi, 2020; Govindan, Mina, & Alavi, 2020; Ivanov, 2020; Kumar, 2020; Mehrotra, Rahimian, Barah, Luo, & Schantz, 2020; Notteboom & Haralambides, 2020; Swanson & Suzuki, 2020). Figure 1 describes the article selection process using the PRISMA (Preferred Reporting of Items for Systematic Reviews and Metal-Analyses) scheme (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009). Table 1 shows the characteristics of the articles.

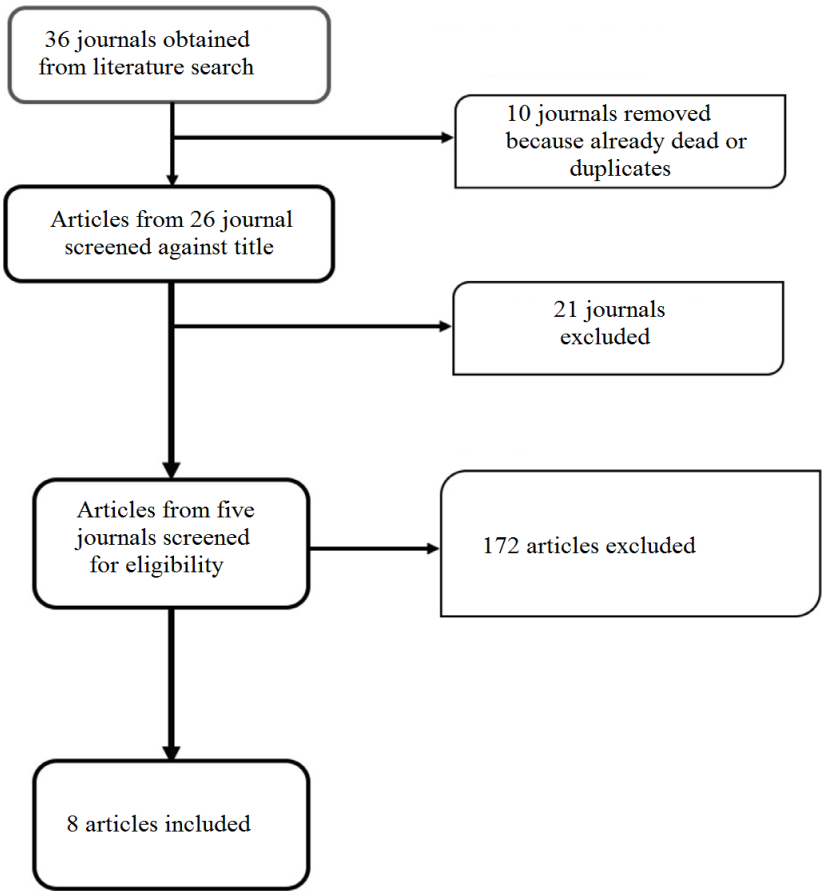

Table 1
Character of the article under study

Article	Journal	Aims	Challenges	Solution
(Swanson & Suzuki, 2020)	Transportation Journal	Review the new aspect of supply chain disruption due to Covid-19.	- Transportation capacity - Marketing channels - Purchasing - Inventory and supply - Manufacturing - Human resources - Public private partnership (PPP) - Security	Theory development
(Choi, 2020)	Transportation Research Part E: Logistics and Transportation Review	Evaluate the innovative "bring-service-near-your-home" operation	Many business operations that require walking-and-visiting-a-fixed-indoor-place consumers are almost impossible to run	Transformation of static service operation into the moving "bring-service-near-your-home" one
(Amankwah-Amoah, 2020)	Transportation Research Part E: Logistics and Transportation Review	Review the global airlines' responds to Covid-19	- In-flight service changes - Flight cancellations - Seeking emergency aids and financial supports - Firm closures	Minimize knowledge erosion based on experience, market capability, routes, airport access, customer base, and customer

				trust's relationship
(Ivanov, 2020)	Transportation Research Part E: Logistics and Transportation Review	Predict the impact of the pandemic on the global supply chain	- Long-term disruption existence - Disruption propagation - High uncertainty	Optimal timing of the closing and opening of the facilities
(Kumar, 2020)	Journal of Humanitarian Logistics and Supply Chain Management	Evaluate the adequacy of block chain technology to the public's distribution system of supply chain	- Shrinkage - Misplacement - Ghost demand	Applying blockchain technology
(Notteboom & Haralambides, 2020)	Maritime Economics & Logistics	Review ports' management after the pandemic	Decrease of cargo volume and vessel calls as well as the general activities in logistic cluster and industry in and around the ports	Exploration of new income or new business model for the port's authority
(Govindan et al., 2020)	Transportation Research Part E: Logistics and Transportation Review	Check on the management of supply chain demands in health care	- Management needs to meet the demands in health supply chain - Public's stress - Covid-19 propagation - The supply	Development of practical supporting system based on society's two-dimension categories: immunity and age

			chain disruption	
(Mehrotra et al., 2020)	Naval Research in Logistics	Examine the stochastic optimization model for critical resources allocation and share	- The increasing demand for ventilator	1. It requires a single coordinator to share the minimum critical resources 2. Various entities of risk-aversion management 3. Early production increase at the beginning of planning cycle

In general, based on the reviews, there are four types of challenges faced by the supply chain in the Covid-19 emergency response management. They are general challenges, demand challenges, service challenges, and safety challenges. We do not review the general challenges that are not related to the supply chain, such as long-term disturbance, disruption propagation, Covid-19 propagation, high uncertainty, and supply chain disruption. The other three challenges are as follows:

Demand Challenges

Demand challenges relate to issues of demand changes, be it a drastic decline or incline. Non-essential product demand decreases. On the other hand, the one for health products increases significantly. The aviation sector clearly is impacted due to demand loss (Amankwah-Amoah, 2020), as so the ports (Notteboom & Haralambides, 2020). Meanwhile, the health sector experiences demand increase, such as the demand for ventilators (Mehrotra et al., 2020) and other health care

(Govindan et al., 2020; Kumar, 2020).

Service Challenges

Service challenges have a relation with how a system works as well as before the pandemic to meet the changes in demand. They are the challenges in market and purchase (Swanson & Suzuki, 2020), manufacturing challenges (Mehrotra et al., 2020; Swanson & Suzuki, 2020), human resources challenges (Swanson & Suzuki, 2020), spatial challenges (Choi, 2020), and human-error provoked ones (Kumar, 2020).

Safety Challenges

It is intriguing that safety has so little attention in studies in the pandemic era. Swanson and Suzuki (Swanson & Suzuki, 2020) acknowledged how important it is to address the issue. Amankwah-Amoah (Amankwah-Amoah, 2020) identified how aviation companies face the safety challenges that forced them to call for emergency aid and financial support, which led to some of them shut their businesses. Society's stress is also a new dimension of the safety issue in this pandemic time (Govindan et al., 2020).

Discussion

This research intends to identify the challenges faced by the supply chain during the Covid-19 pandemic. The result describes one part of economic and health dynamics with a gap in the literature. The finding essentially shows that the pandemic brings various problems to the supply chain, some of which are relatively new and require further exploration.

The findings suggest that issues related to demands are quite common during the Covid-19 pandemic. Some of the most general problems found before the pandemic include cancellation, demand management, ghost demand, and volume decline/incline (Awad et al., 2016; Basiri & Heydari, 2017; Dulebenets, 2018; Gu et al., 2011; Mayyas, Steward, & Mann, 2019; Patel et al., 2017). We also found a new issue that has never been studied before, the ghost demand. It is an unexpected demand from an unknown party in a supply chain network. In the medicinal supply chain, it might come from those who are not listed but desperately need the medication. Thus, some have to be sent to them and arrived in the destined places in less number. Ghost demand can also appear at the end of the destination when the number of the recipients is larger than planned, or when they ask for more than is anticipated. It is possibly due to insufficient information on how much is the actual need in the supply chain. This issue surfaces in the Covid-19 pandemic era as there is no fixed number of patients or health workers requiring the supply in one drop ship.

The common service issues that are found remain the same before and during the pandemic era. The classical ones include supply purchase, human errors, marketing failure, and service changes. Researchers have addressed those prior to the pandemic (Koonin & Patel, 2018; Li et al., 2018; Ventola, 2011). However, they have not explored specific matters, especially in the aviation industry. The service change in it is a new issue. It includes the efforts to guarantee passengers' health on board while maintaining the maximal service. They cover intensified disinfection after landing, removal of the blankets, pillows, and reading materials, use of masks and gloves, upgraded safety of food and beverage, social distancing, body temperature check, hang hygiene, respiratory etiquette, preparation of emergency advice, and leaving the central seats vacant (Amankwah-Amoah, 2020; WHO, 2020). The public-private issue is also an intensifying matter in the Covid-19 era as the supply chain gets vulnerable and requires the government's cooperation (Swanson & Suzuki, 2020). The physical channel closure and migration to digital service are still in the non-supply-chain literature, rather than the supply chain ones.

Safety issues include aid search and financial support, business shutdown, and public's stress. They are the issues in the studies of the supply chain in the past (Jamieson & Kellerman, 2016; Kelly-Cirino et al., 2019; Nayyar et al., 2019). In the Covid-19 era, there are more intensive matters, not only for the human resources in the supply chain but also for the society. They include upgraded safety in airports, data security, and health safety (Amankwah-Amoah, 2020; Deloitte, 2020; Mehrotra et al., 2020).

The literature that we gathered suggests a number of interventions to overcome the new issues in the supply chain. They are ghost demand, in-flight service changes, public-private partnership, virtualization, and general safety (Amankwah-Amoah, 2020; Choi, 2020; Kumar, 2020; Swanson & Suzuki, 2020). According to Kumar (Kumar, 2020), we can address ghost demand by applying blockchain technology. The in-flight service changes and safety can be overcome by minimizing knowledge erosion based on experience, market capability, route network, access to the airport, customer bases, and trusted relationship with the customers (Amankwah-Amoah, 2020). It partly shows the need for the infrastructure of business intelligence in the aviation supply chain. The public-private relationship can be solved with the development of a contingency system through joint planning. The virtualization is dealt with the "bring-service-near-your-home" technology (Choi, 2020).

This research shows that the supply chain calls for at least three types of modernity: blockchain technology, mobile service technology, and business intelligence technology. The blockchain technology is a distributed record

database, or a mutual public/private lodger of all the digital events carried out by and shared among the agents participating in the blockchain (Crosby, Nachiappan, Pattanayak, Verma, & Kalyanaraman, 2016). This technology allows the disintermediating and decentralizing transaction, as well as global-scale processes between various parties. It also guarantees anonymousness through cryptographed record preservation, which, at the same time, encourages transparency (Saberi, Kouhizadeh, Sarkis, & Shen, 2019). This feature is possible due to the impracticality of a large-scale record deletion and accessibility to every recorded transaction (Crosby et al., 2016).

Blockchain has been introduced into the supply chain as an effort to boost sustainable and responsible management (Francisco & Swanson, 2018; Saberi et al., 2019). It does not require trust-building between partners as transactions are verified by most participants that determine the consensual rules (English, Auer, & Domingue, 2016).

Nevertheless, blockchain has to face obstacles, whether in behavioral, technical, organizational and policy aspects, in its implementation (Yli-Huumo, Ko, Choi, Park, & Smolander, 2016). It is owing to the absence of the central authority that is responsible for management and information validation (Saberi et al., 2019).

Blockchain's effectiveness in encouraging solutions for ghost and other demand issues in the supply chain accelerates its adoption by private and public practitioners. A similar thing applies to mobile service technology that has been around since smartphones become parts of society. It also happens to business intelligence technology in general. This fact means that technological gadgets have been maximally used when the supply chain faces new issues or old but intensifying issues due to the pandemic.

Conclusion

This study comprehensively investigates research and literary reviews on the supply chain in emergency management during Covid-19. Journal literary reviews using the keywords "supply chain" and "logistics" in 2020 in the Scimago generate eight articles that discuss the challenges faced by the supply chain. We managed to identify 27 of them, which we categorized into four: common, demand, service, and safety. Some new challenges are unidentified or have not been explored properly. They are ghost demand, in-flight service, public-private relationship, virtualization, and general safety (Amankwah-Amoah, 2020; Choi, 2020; Kumar, 2020; Swanson & Suzuki, 2020). The literature offers technical and non-technical solutions. The first one includes supply chain modernity in blockchain technology, mobile service technology, and business intelligence technology. The latter involves the development of a contingency system through

joint planning by public and private groups. Therefore, the government and private sectors need to begin adopting these technologies to increase the supply chain's effectiveness and efficiency, especially during a pandemic era or other similar disturbances.

However, the method applied in this research is limited. Some supply chain articles might slip our attention as they are not published in journals that specifically discuss supply chain, or they have no Covid-19 word in their titles. As an example, a study by Jiang et al (Jiang, Wang, Liu, Hu, & Xie, 2020) is excluded, although it discusses the evaluation methods of critical factors that affect the reliability of emergency logistics systems in the Covid-19 pandemic era. It is published in a journal that does not specifically explore the supply chain and its title contains neither pandemic nor Covid-19 words. Further meticulous research is required to cover more findings in this pandemic era.

Statements of Ethics and Conflict of Interest

"I, as the Corresponding Author, declare and undertake that in the study titled as "A New Challenge of Supply Chain in Emergency Response Management: A Case Study of Covid-19 Pandemic", scientific, ethical and citation rules were followed; Turkish Online Journal of Qualitative Inquiry Journal Editorial Board has no responsibility for all ethical violations to be encountered, that all responsibility belongs to the author/s and that this study has not been sent to any other academic publication platform for evaluation."

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