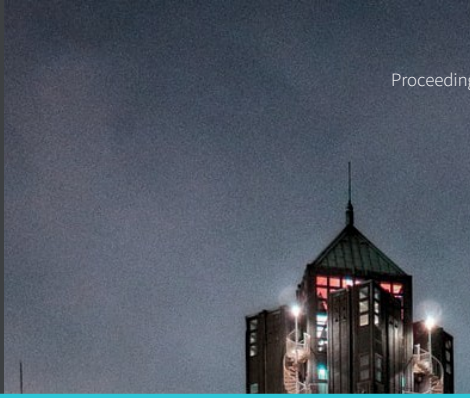

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# Identifying Research Gaps in Supply Chain Innovation

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# Identifying Research Gaps in Supply Chain Innovation

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**Purpose:** In recent years, supply chain innovation (SCI) has become a central characteristic of firms in creating dynamic competitive advantages. The present study aims to examine the SCI literature in the last five years.

**Originality:** Although there is much research on supply chain management (SCM), innovations, sustainable supply chain (SSC), and green supply chain (GSC), limited research has identified gaps in the SCI.

**Findings:** The study offers useful implications for researchers, managers, marketers, and other stakeholders involved in the SCI. The study also motivates the researchers to conduct additional studies in the area of SCI. Furthermore, the results of this study contribute to building new research agendas concerning SCI.

**Methodology:** The study adopts a qualitative content analysis approach to examine the literature on SCI (from 2014 to 2019). Qualitative software MAXQDA12 was applied for literature content' classification and coding.

**Keywords:** Supply Chain Innovation, Qualitative Content Analysis, MAXQDA

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## 1 Introduction

A large amount of wealth and creating values occurs in the supply chain (SC) and supply chain management (SCM). SCM has an indispensable role in fostering organizational performance and improving supply chain innovation (SCI). SCM is synonymous with combined logistics systems, focusing upon reducing the storage of goods through the supply chain (Chong et al., 2011).

The concept of supply chain(SC) refers to the procedures from the early raw resources to final and completed product connecting across supplier-user businesses, or as the roles inside and outside a corporation that allow the value chain to produce goods and offer facilities to the user (Chitale & Gupta, 2014; Cox, 1999).

Researchers shows that 'innovation' is the skill of producing economic values from new ideas that represent progress in the economic development of organizations. Innovation is a significant factor in generating success and competitive advantages within organizations while at the same time, it has also brought significant challenges for organizations (Gao, Xu, Ruan, & Lu, 2017; Schumpeter, 1934; Wu & Tsai, 2018).

Supply chain systems are continually varying as an outcome of social as well as technological developments (Zijmet et al.,2019). The efficient functioning of SC is particularly essential to those companies which attempted to improve their SC systems' effectiveness (Azevedo, 2013).

Based on resource-based view (RBV), SCI integrates innovative activities with logistic approach (logistics-related services), innovative marketing-fo-

cused activities (customer needs), and other related activities (e.g., developing technologies, creating new knowledge and technical skills) to augment joint profit (Bello et al., 2004; Jajja, Kannan, Brah, & Hassan, 2017; Paulraj & Chen, 2004; Wong & Ngai, 2019). SCI is a change in processes, technology, and network, meaning that SCI improves competitive advantage and organizational performance.

By analyzing the literature of the supply chain innovation, we found that although numerous articles have been published regarding the SCI, none of them have thoroughly addressed the gaps in the SCI. Wong and Ngai (2019), systematically reviewed 18 years of the SCI literature in order to find the research gaps. However, their study focused only on a general overview of SCI employing Gregor's (2006) theory classification. It is still necessary to examine existing research gaps. In this study, we reviewed the SCI literature from 2014 to 2019 to identify research gaps and address some future research directions on this critical topic.

Hence, in this study we review and analyze the available literature, looking for an answer to the question of "RQ: how to make the supply chain more competitive?". Therefore, to reach the aim of the study, in the next section, an overview of the SCI literature will be given. Then we explain research methodology and present result of preliminary analyses. Content analysis by MAXQDA 2018 was applied. Finally, we reflect findings, and highlight some possible future research perspectives.

## 2 Literature Review

SCI has been received many scholars' attention (Abdelkafi & Pero, 2018; Arlbjørn et al.,2011; Gao et al., 2017; Iddris, 2016; Munksgaard et al.,2014; Sabri et al.,2018; Tan et al., 2015; Yoon et al., 2016; Zimmermann et al., 2016) . In the 1980s, organizations focused on a range of diverse systems to achieve sustainable competitive advantages. However, since competitors mimicked these competitive advantages, they did not have the necessary stability. Indeed, attempts to optimize organizational processes without taking into account of external companies, especially suppliers and customers, seemed ineffective, and meanwhile, organizations in cooperation with each other had better performance. It was here that the supply chain concept was born. (Stavrulaki & Davis, 2010).

Porter (1990) and Drucker (1985) pointed out that innovation is a characteristic feature of organizational sustainability, and organizations with high levels of knowledge in technology are required to pay more attention to innovation strategies. Innovation is indeed the process of transforming opportunities into new ideas, as well as the application of such new ideas to foster specific improvements (West & Farr, 1989).

SCI is a procedure that can improve organizational processes to manage effective SCM through integrated interactions with suppliers, producers, distributors, and customers. (Lin, 2007). Thus, SCI causes time and cost reduction, developing novel operational techniques and reliable delivery system for coping with growing changes in the business (Lee et al.,2011). Chapman et al. (2003), propose that service industries should focus on SCI for effective delivery services. Researchers agree that supply chain innovation

helps companies to maintain their competitive position and improve supply chain performance (Flint, Larsson, Gammelgaard, & Mentzer, 2005; Franks, 2000; Krabbe, 2007; Lee et al., 2011).

Flint and Larsson (2007), examined innovation management process and SC Learning as an SCI' antecedents and considered as part as creating a customer. Herzlinger (2006), Highlighted three types of innovation in service sectors (i.e., customer-focused, technology-based, integrated innovation) in the SCI process. Hui et al. (2015) found that participatory management influences the innovative performance of the supply chain.

Dubey, Singh, and Tiwari (2012), found that innovation in supply chain processes (e.g., sales management and the number of orders) had a significant effect on the SC performance. Thus, Suppliers and manufacturers required to transform their business through innovation in SC to gain success among competitive industries (Wong & Ngai, 2019). According to Shapiro & Wagner (2009), modeling technologies allow managers to manage data more effectively in their companies, thus creating rationality in a supply chain network.

The supply chains are responsible for including any fast transfer and distribution of technological innovations (Sabri et al., 2018). Cai et al.,(2009), found that SC-affiliated companies, which produce innovative products for the general market, might utilize a supply chain model to meet their daily innovative needs in the supply chain.

Arlbjørn et al., (2011), considered SCI as a gradual or a fundamental change in the supply chain network, technology or business processes in the SC framework in their systematic review.

Moreover, recent discussions of sustainability and sustainable have been developed in supply chain. Sustainable supply chain (SSC) means managing of material, information, and coordination considering economic, social, and environmental dimensions. Researchers have claimed that emerging companies perform better in the sustainable supply chain (e.g., Nidumolu et al., 2015; PAGELL & WU, 2009). The sustainable supply chain is rooted in the traditional concept of SC. Therefore, evaluation of the SSC performance can be useful in creating transparency and fostering innovation in the supply chain (Schaltegger & Burritt, 2014). It has been confirmed that supply chain management can encourage innovation in organizations (Chong et al., 2011). Given the sustainability of current competitive business environments, researchers consider innovation as central to the supply chain (Jellali & Benaissa, 2015).

The effect of SCI on companies depends on their size. In large-sized firms, when innovations are developed to improve supply chain performance, it may result in new businesses. Accordingly, SCI leads to the expansion of the portfolio for a large-sized company. This phenomenon happens when a company uses logistics innovation to optimize its core processes and launch new values in the marketplace (Abdelkafi & Pero, 2018).

Reviewing the supply chain, Wong & Ngai (2019), found that the literature has tended to focus mainly on the concept of supply chain structures, ignoring the development of measures for operationalizing the concept. Therefore, by conducting in-depth analysis and analyzing the content of the studies, research gaps in SCI can be identified. As noted earlier, the present study examines the SCI literature in the last five years (2014-2019). Table 1 summarizes the articles, publication year, and field of study.

Table 1: The SCI Literature from 2014 to 2019

| Studies | Journals/Proceedings | Area of Study |
|---|---|---|
| Munksgaard et al., 2014 | Operations Management Research | Proposed an SCI model with three interactive components: network structure, technology, and business processes. |
| Artsiomchyk & Zhivitskaya, 2015 | IFAC-PapersOnLine | Proposes an integrated approach to help companies manage innovation and design sustainable supply chains. |
| Jangga, Ali, Ismail, & Sahari, 2015 | Procedia Economics and Finance | Uncertainty and flexibility of the supply chain |
| Tan et al., 2015 | International Journal of Production Economics | Using big data to gain competitive advantage through SCI capabilities. |

| Studies | Journals/Proceedings | Area of Study |
|---|---|---|
| Nasr, Kilgour, & Noori, 2015 | European Journal of Operational Research | Examine innovation distribution versus protection between SC partners. |
| Yoon et al., 2016 | Technological Forecasting and Social Change | Illustrated that SCI plays an essential role in fostering operational procedures for SC effectiveness. |
| Iddris, 2016 | International Journal of Innovation Science | Developing SCI'capability constructs |
| Rajabian Tabesh, Batt, & Butler, 2016 | Journal of Food Products Marketing | Relationship between different theoretical constructs and how they affect SCI and performance. |
| Stentoft, Mikkelsen, & Jensen, 2016 | Supply Chain Forum: An International Journal | Comparison of external and internal products from SCI' perspective |

| Studies | Journals/Proceedings | Area of Study |
|---|---|---|
| Gao et al., 2017 | Journal of Cleaner Production | Reviewing 107 studies published from 1996 to 2014. Proposing a theoretical framework encompassing the meaning of sustainable supply chain innovation. |
| Shah & Naghi Ganji, 2017 | British Food Journal | Lean production and SCI in food industry |
| Stentoft & Rajkumar, 2018 | Innovation and Supply Chain Management | Connection between SCI and organizational and market performance. |
| Sabri et al., 2018 | Journal of Engineering and Technology Management | Implementation of process and product innovation in SC framework. |

| Studies | Journals/Proceedings | Area of Study |
|---|---|---|
| Shou, Che, Dai, & Jia, 2018 | International Journal of Operations & Production Management | Examining complementarity and similarity in SCs |
| Kwak, Seo, & Mason, 2018 | International Journal of Operations & Production Management | the linkage between SCI, risk management capabilities, and competitive advantage in international supply chains. |
| Ted et al.,2018 | The International Journal of Logistics Management | SCI and sustainable transport |
| Wu & Tsai, 2018 | Transportation Research | setting new business models based on new SC and logistics methods. |
| Abdelkafi & Pero, 2018 | Business Process Management Journal | Exploratory analysis of SCI' models |

| Studies | Journals/Proceedings | Area of Study |
|---|---|---|
| Chen, Dimitrov, & Pun (2019) | Omega | Diverse types of subsidy, collaboration and effort, and companies' incomes in SCI |
| Ardito, Messeni Petruzzelli, Dezi, & Castellano (2018) | Journal of Business Research | Exploring the influence of SC' knowledge sourcing actions on innovation initiatives. |
| Wong & Ngai (2019) | Industrial Marketing Management | Systematically reviewing the construct of SCI. |
| Reimann, Xiong, & Zhou (2019) | European Journal of Operational Research | Examining the relationship between remanufacturing and the opportunity to lower the variable remanufacturing cost via innovation process |

| Studies | Journals/Proceedings | Area of Study |
|---|---|---|
| Lv & Qi(2019) | Computers & Industrial Engineering | Choosing the interactive partner of SC based on innovation resources |
| Hsin Chang, Hong Wong, & Sheng Chiu, (2019) | Information & Management | Development of the conceptual framework for understanding factors of business systems leveraging (BSL) |
| Russell & Swanson (2019) | The International Journal of Logistics Management | Probing gaps between information processing and SC dexterity. |

## 3 Research Methodology

There are three approaches to explore the status of knowledge in a particular field of study: Delphi-based method, meta-analysis, and content analysis (Li & Cavusgil, 1995). The Delphi method draws on a panel of experts familiar with the field. In the meta-analysis, the results of multiple empirical studies are combined and analyzed based on effect size. Finally, content

analysis is a scientific approach used to summarize and analyze qualitative data (Neuendorf, 2016). Content analysis provides researchers with a tool to systematically extract and analyze multiple data. In qualitative research, there are different approaches to data analysis depends on the nature of the questions and research problems. In this study, the researchers used content analysis to discover underlying aspects of SCI. Thus, content analysis is an appropriate tool to extract, analyze, and interpret the gathered data. Content analysis is an appropriate strategy, especially when the data are in the form of documents and texts. By analyzing and describing the previous theoretical research concerning with supply chain innovation, the authors first review, analyze and summarize the SCI research, then present a framework for studying supply chain research, and finally, suggest several ideas for future research. The stages of content analysis used in this study are shown in Figure 1.

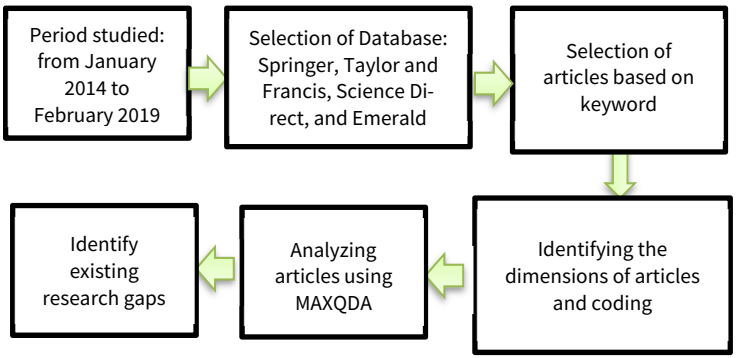



Figure 1: Stages Involved in Content Analysis

In the first phase, this study collected articles related to SCI. The authors focused on articles published from January 2014 to February 2019, searching for keywords such as 'supply chain innovation' 'innovation in the supply chain' The full text of each article was carefully analyzed in order to remove articles unrelated to SCI.

In the next phase, articles were selected and collected from accredited databases such as Science Direct, Taylor & Francis, Emerald, and Springer. The reason was that these databases publish relevant and appropriate articles related to SCI. The study did not include prefaces, editing notes, book reviews, general reports, BA, MA, and Ph.D. theses, and textbooks. Although we cannot guarantee that this research is comprehensive, we believe that the selected journals and articles contain a holistic structure of research done on SCI. Finally, extensive literature analysis generated 25 articles related to SCI.

## 4 Analysis and Results

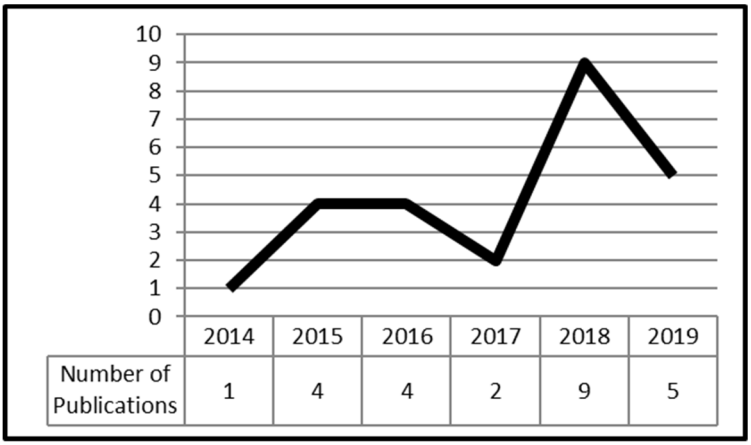
Since the primary purpose of this study was to investigate and identify Identifying research gaps in supply chain innovation, our search resulted in 25 articles related to the concept. In addition, this study employed the content analysis, several sections of the literature were analyzed (e.g., Introduction, literature reviews, methodology, and research limitations). Such classification highlights the growth of research on supply chain innovation.

Table 2: publication types and numbers

| Database type | Count | % |
|---|---|---|
| Article | 21 | 84% |
| Proceedings | 2 | 8% |
| Review | 2 | 8% |

Table 2 shows the structure of SCI literature database ranging from 2014-2019. As shown in table 2, the majority of publications are articles (84%).

The growth of research in SCI literature was determined by conducting a




frequency analysis of articles published annually. (See Figure 2)

Figure 2: related to SCI' publications (2014-2019)

As revealed in Figure 2, since 2015, the number of articles related to supply chain articles has increased steadily. In 2015 and 2016, proper attention was paid to SCI. Although In 2017, SCI studies were declined substantially, there is a continued increase in SCI studies in 2018. Since the present study included two months of 2019, it is hard to predict any increase or decrease in SCI studies. However, it can be argued that the attention to SCI has been increasing since 2015, as there were not many relevant articles in the previous year.

According to Table 1, SCI studies were published in journals, including Operations Management Research, European Journal of Operational Research, etc. Our literature analysis showed that several topics related to supply chain innovation are of rising interest to marketers in various industries and businesses.

In this study, we conducted a content analysis approach to detect research gaps in supply chain innovation using MAXQDA. We hope that future research will draw more on content analysis methods and provide significant opportunities for research in the area of SCI.

## 4.1 Summary of the results of content analysis using MAXQDA

In this section, a summary of the key steps in conducting content analysis is presented. Content analysis can be used to analyze textual, audio and video data. First, data are analyzed using open, axial and selective coding stages. Then MAXQDA is used to analyze the qualitative data effectively. Fi-

nally, initial codes, emerging categories and related dimensions are determined in the open coding stage. In the axial coding, the main categories are identified and elaborated.

The first step in conducting content analysis is to determine the variables and factors. When the conceptualization and usability of variables are completed, the researcher can continue the coding process(Neuendorf, 2016). If the utility of the variables does not match with the definition of variables, the coded data will be wrong in the next stage, and inaccurate results will be presented. In this study, the open coding stage began considering articles and literature. In this stage, the relevant text was carefully analyzed and related SCI information was extracted. The result of this process was some notes considered as initial data. Concepts were extracted from these initial data. In the first stage, 970 initial codes (e.g., increased market share and operational performance of supply chain innovation, formulation of strategic objectives, human capital and skilled force in technical projects, interdependence among companies) were extracted. After removing and adjusting the initial codes, 34 principal codes were obtained (see Table 3 and Figure 3). When concepts created, it is necessary to group them under categories having higher explanatory power. When a category is identified, clarification of its features and dimensions requires careful attention. Therefore, at this stage, the constant comparative analysis was employed to find similarities and differences between the concepts and similar concepts were placed in a category. Table 3 introduces categories related to the concepts.

After specifying the categories, the axial coding step begins. The axis coding is the process of connecting categories at the level of features and dimensions. It is called "axial" because the researcher attempts to make a connection among categories. As Corbin & Strauss (2008) observed, categories that have a logical connection with each other are all subsumed under the central construct. i.e., supply chain innovation.

Table 3: Extracted Codes from literature

| **Selective Code** | **Open Codes (Categories)** | **Initial/Primary Codes** |
|---|---|---|
| Supply chain innovation | SCI' moderators | The rapid growth of the industry, Firm size, Technological intensity, Equity |
| | | Product characteristics |
| | SCI' driving forces | Aggregation of ideas, Knowledge, and skills |
| | | Internal coordination |
| | | Research and development |

| Selective Code | Open Codes (Categories) | Initial/Primary Codes |
|---|---|---|
| | | Workforce training |
| | | Focus on knowledge |
| | | Interdependence among companies |
| | | Flexibility towards the environment |
| | | Product timing |
| | | Aligning business strategy with supply chain |
| | | Functional supply chain management |
| | | Leadership and senior management |
| | | Effective logistics processes |

| Selective Code | Open Codes (Categories) | Initial/Primary Codes |
|---|---|---|
| | | Intra-organizational processes |
| | | Innovation in logistics |
| | | Innovation in business processes |
| | | Innovation in network structure |
| | | Technological innovation |
| | | Human capital and skilled force in technical projects |
| | | Formulating strategic goals (general to particular) |
| | Consequences of SCI | Customer value |

| Selective Code | Open Codes (Categories) | Initial/Primary Codes |
|---|---|---|
| | | Reduced cost |
| | | Competitive advantage |
| | | Risk management |
| | | Improving the supply of goods |
| | | Operational performance of innovation in supply chain |
| | | Creating values |
| | | Delivering value |
| | | Gaining values |
| | | Supply chain development |

According to Table 3 and Figure 3, in this study, three categories of open coding including SCI' moderators (4 items), SCI' driving forces (20 items), and the Consequences of SCI (10 items) were generated. Figure 3 shows the frequency of each category of items in terms of its importance.

Figure 3 shows the importance of categories. Since innovation plays a crucial role in creating competitive advantages, the ability to generate innovation is becoming an essential area of attention in innovation research. In this study, we considered this capability as "SCI' driving forces" – a critical factor in the survival of companies. Based on the output matrix of MAXQDA, and Figure 3, 20 codes were identified as a driving force in the supply chain. From these codes, the most essentials are the interdependence among companies, flexibility towards the environment, aggregation of ideas, knowledge, and skills, innovation in business processes and technology, product characteristics, and human capital (see Figure 3). It was found that the nature of products and product demand are associated with supply chain innovation. Characteristics such as product life-cycle management, product diversification, product sales forecast, and product distribution intensity stimulate innovation in the supply chain. Product characteristics exert an essential effect on the design and application of SCI. When delivering any product to the market, the product itself affects the supply chain. Thus, the supply chain requires redesigning in order to deliver the product to the marketplace successfully.


Figure3: MAXQDA Code Matrix Browser

Flexibility to the environment helps organizations meet their current needs, without losing the ability to produce. Since some organizations no longer compete as an independent organization, they prefer to compete as a supply chain. Therefore, the concept of flexibility has been expanded from an organizational focus to the supply chain. Moreover, an expert with technical skills can influence innovation in the supply chain. Human capital has always been emphasized as an important source of innovation (McGuirk et al., 2015; van Uden, Knoben, & Vermeulen, 2017). Human capital is a major driving force behind an organization's economic growth and a crucial factor in generating success and innovation. Aggregation of ideas, knowledge, and skills is also a vital part of organizational strategy in the process of supply chain innovation. Companies seek opportunities to foster their corporate knowledge. When the knowledge is shared, performance, as a result, will be increased because the primary source of innovation in the supply chain is the knowledge that the organization has access to it. Therefore, successful organizations are those who can acquire the most useful and reliable knowledge in their business and use them effectively. Such valuable knowledge must be managed skillfully. Innovative organizations actively promote their members' knowledge, provide a high level of job security, and help their employees change.

Information and Communication Technology (ICT) is another area rapidly affecting business processes. Since technological innovation is the result of product innovation (services) and innovation in business processes, as a capability and stimulus, it can expand supply chain activities and processes. The development, diffusion, and use of innovation in practice can be act as a stimulus for the process of SCI.

The role of SCI in generating competition and growth is a precise fact, as observed by managers, policy makers, and researchers. Ideally, SCI can improve efficiency and operational performance, manage risks, reduce costs, and create a competitive advantage for the organization. Supply chain innovation can both increase and reduce business risks (Kwak et al., 2018). Any risk associated with the flow materials and information can disrupt the operation. Therefore, it can be argued that SCI not only advances the supply chain' performance but also develops the ability to manage related risks. In the traditional supply chain, opportunities or risks cannot be controlled by companies, and it is supply chain innovation that provides an effective solution to such problems. Depending on the organization's priorities, supply chain innovation can improve products and services, reduce costs, prevent waste of resources, and increase efficiency. Reducing costs is, in fact, one of the key outputs of innovation in the supply chain, leading to increased efficiency, competitiveness, and profitability.

On the other hand, the rapid growth of the industry, firm size, technological intensity, and equity are the moderators of SCI. Firm size plays a leading role in SCI. SCI' functions differently in large sized companies as it generates portfolios and improves business performance. Technological intensity is effective in improving and adjusting supply chain innovation. Although the application of advanced technologies increases costs in the initial stages, it ultimately leads to improved performance and efficiency.

## 5 Discussion

This study explored previous research on supply chain innovation using qualitative content analysis. The employment of content analysis is vital in

SCI because dominant quantitative methods might fail to meet the expectations of individuals and organizations. Therefore, the present study contributes to supply chain and SCI, and provides opportunities for the advancement of SCI through the employment of content analysis methods. Although content analysis methods have been used in SCM literature, SCI studies have not deployed a content analysis methodology.

Additionally, among the 25 articles in this study, only two systematic review articles dealt with SCI (Gao et al., 2017; Wong & Ngai, 2019). This indicates a lack of qualitative studies employing content analysis methods. Thus, our study demonstrates that research gaps in supply chain innovation can be more effectively studied through qualitative content analysis methods.

According to the results of the present study, research opportunities were discussed in three areas (moderators ,driving forces and consequences). Therefore, considering advances in technology and knowledge, managers should realize the significance of innovation and the management of innovation in all parts of the organization. There are many opportunities for future research. For example, in order to promote supply chain innovations, it is essential to engage all members of the organization (e.g., employees, managers) in research and development, and to take advantage of customer ideas information of activities in the organization. Considering issues such as high demand as well as competition at the international and supranational level, the importance of the final customer should be prioritized. Besides, it is essential to pay attention to innovation facilitators/moderators when evaluating supply chain innovation.

The present study has three limitations. First, we focused on those articles published in the English language, ignoring other articles in non-English

languages. This bias might result in a lack of useful information in the area of supply chain innovation. Second, we restricted our study to four databases. Local-scientific journals and theses can offer a rich picture of the supply chain. Third, we did not analyze the articles separately based on the research setting and industry under investigation. Addressing these limitations, further research can provide rich insights into supply chain innovation

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