THE APPLICATION OF ORGANIZATIONAL INFORMATION PROCESSING THEORY IN SUPPLY CHAIN MANAGEMENT STRATEGY RESEARCH: A BIBLIOMETRIC REVIEW

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Abstract

This study investigates the role of organizational information processing theory (OIPT) (Galbraith, 1974) in enhancing corporate and business decision-making within the complex and dynamic landscape of supply chain management (SCM). By conducting a comprehensive bibliometric analysis of peer-reviewed articles indexed in the Web of Science (WoS), utilizing bibliometric tools such as VOSviewer (van Eck & Waltman, 2010) and Scimago Graphica (Hassan-Montero et al., 2022), this research aims to map the intellectual structure and evolution of OIPT in the SCM domain. The study explores the current state of OIPT application in SCM, identifies key research themes and trends, and uncovers the relationships between OIPT and other relevant theoretical frameworks. Findings reveal that OIPT has emerged as a critical lens for understanding how organizations process information to make effective SCM decisions, particularly in emerging technologies like the Internet of Things (IoT), artificial intelligence (AI), and blockchain. This research contributes to the theoretical development of SCM by elucidating the mechanisms through which information processing influences supply chain performance. Furthermore, it provides practical implications for managers seeking to leverage information technology (IT) to improve decision-making and build resilient supply chains. By identifying knowledge gaps and promising research avenues, this study stimulates future research on integrating OIPT with other theoretical perspectives and exploring its application in specific SCM contexts.

Keywords: Organizational Information Processing Theory, Supply Chain Management, Bibliometric, VOSviewer, Web of Science

Authors' individual contribution: Conceptualization — Y.Y., A.A.R., K.A., and Y.A.A.; Methodology — Y.Y.; Formal Analysis — Y.Y. and Y.L.; Investigation — Y.Y.; Writing — Original Draft — Y.Y.; Writing — Review & Editing — Y.Y. and A.A.R.; Visualization — Y.Y.; Supervision — Y.Y., A.A.R., K.A., and Y.A.A.

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1. INTRODUCTION

The advancement of modern information technology (IT) has enabled corporations to interconnect their processes and effectively respond to environmental changes. The utilization of information systems (IS) is becoming more prevalent among organizations as they aim to expedite task completion. A suitable and efficient theory can provide a reliable guarantee for the operation of modern enterprises. Galbraith (1971, 1977) initially developed the organizational information processing theory (OIPT): in light of the dynamic changes that businesses were experiencing at the time. An organization can either expand its information processing capacity or use mechanical methods to lower its information requirements. In recent years, OIPT has become a persuasive theory of information utilization to acquire a competitive advantage, mainly when organizations carry out activities with a high level of uncertainty (Galbraith, 1974; Srinivasan & Swink, 2015, 2018; Zhu et al., 2022; Dubey, Gunasekaran, Childe, et al., 2019). A high-performing supply chain operation requires addressing numerous challenges and facing countless uncertainties. IS issues in supply chain management SCM can pose significant challenges. The emergence of OIPT seems to offer a reliable guarantee for the smooth operation of the supply chain. Recently, OIPT has been increasingly applied to SCM research. The theory provides a framework for understanding how organizations process information to make decisions and how they can use IT to improve their decision-making processes.

SCM has become an essential aspect of business strategy and operations, with numerous scholars and practitioners contributing to its evolution and development (Mentzer et al., 2001). SCM has been "particularly impacted by the growth and development of information technology" (Sanders, 2005, p. 4). Our review focuses on those SCM studies that utilize the OIPT theory to explain and describe, striving to find connections between them, discover the strengths of OIPT theory, and thus better apply OIPT theory to define and describe the changes that more and more emerging technologies will bring to supply chain research in the future.

With the rapid development of emerging technologies such as artificial intelligence (AI), blockchain technology (BT), and the Internet of Things (IoT), SCM is undergoing unprecedented changes. OIPT, as a discipline that studies how organizations acquire, process, and utilize information to support decision-making, has played an increasingly important role in explaining supply chain phenomena. In recent years, more and more scholars have begun to apply OIPT to SCM research to gain a deeper understanding of information flow, decision-making processes, and coordination mechanisms within supply chains. However, a comprehensive search of existing literature reviews did not identify any that had addressed this specific topic. This study is therefore designed to pioneer a new research direction through the application of bibliometric analysis.

We have selected several peer-reviewed papers indexed in the Web of Science (WoS) journal list and mentioned or linked to OIPT theory. By using two bibliometric tools, VOSviewer (van Eck & Waltman, 2011) and Scimago Graphica (Hassan-Montero et al., 2022), we can more intuitively clarify the current state of research. The aim is to explore and expand the application of OIPT in the context of SCM research, enrich theory, and guide researchers to collect data in a more precise and targeted manner. This will enable subsequent researchers to have a deeper understanding of OIPT. Overall, this research has three main contributions: first, this bibliometric study presents a summary of research that uses the OIPT theory to explain or describe SCM problems. Second, this paper uses bibliometric tools to describe and review research associations using OIPT theory in the SCM field. Third, this paper looks forward to the possible future direction of integrating OIPT theory with 'SCM + emerging technology' research. These findings highlight the considerable growth potential of research based on OIPT. This paper attempts to explore the following research questions:

RQ1: What are the bibliometric characteristics of academic research literature applying organizational information processing theory?

RQ2: What are the correlations and commonalities in the supply chain management literature applying organizational information processing theory?

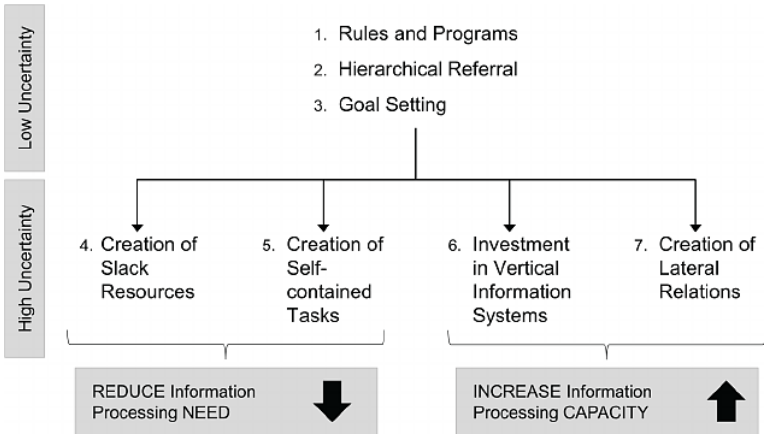
RQ3: What are the future research directions for organizational information processing theory + supply chain management after using emerging technologies?

The structure of this paper is as follows. Section 2 presents a literature review that summarizes the research background of OIPT, SCM, and bibliometrics. Section 3 outlines the research methods and data collection process conducted using Scimago Graphica. Section 4 presents the results of a co-occurrence analysis of keywords related to SCM studies utilizing OIPT, conducted using VOSviewer software. Section 5 offers research suggestions regarding research methods, variables, and data collection in light of the emerging trends of new technologies applied in SCM research. Section 6 incorporates conclusions, implications, and limitations.

2. LITERATURE REVIEW

The OIPT serves as a theoretical framework elucidating the processes by which organizations manage information and arrive at decisions. J. R. Galbraith proposed it in the 1970s (Galbraith et al., 1977) in response to the dynamic changes businesses were experiencing. OIPT posits that organizations can augment their information processing capabilities or employ mechanistic approaches to reduce information demands.

Figure 1. Organizational information processing theory



Source: Galbraith (1973, 1977).

This theoretical framework centers on three fundamental notions: the demands for information processing, the capabilities for information processing, and their harmonization to achieve optimal performance, as illustrated in the accompanying diagram. To navigate environmental uncertainty and enhance decision-making, organizations necessitate high-quality information. They commonly employ two strategies: the first involves implementing buffers, like inventory or safety reserves, to mitigate the effects of uncertainty; the second entails deploying structural mechanisms and information processing capabilities to amplify information flow and diminish uncertainty. These strategies encompass redesigning business processes, implementing integrated IS, and enhancing information flow between organizations in the supply chain to address uncertainties effectively (Premkumar et al., 2005).

SCM involves the integration of business processes across organizations, from material sources and suppliers through manufacturing to the final customer (Lummus & Vokurka, 1999; Lambert, 2008; Greasley, 2019). The term SCM has evolved from focusing solely on logistics and physical distribution to encompassing broader inter-organizational relationships and strategic integration (Lummus & Vokurka, 1999; Wisner & Tan, 2000; Ballou et al., 2000). Given global supply networks' increasing complexity and unpredictability, SCM in uncertain environments is a crucial research area. Supply chain uncertainties, originating from factors like demand fluctuations, supply disruptions, and external influences, necessitate effective management strategies to ensure operational efficiency and strategic success (Simangunsong et al., 2011; van der Vorst et al., 1998; Chen et al., 2023).

Uncertainty, a core concept within OIPT, is a driving force behind the development of information processing capabilities, as emphasized by Goodhue et al. (1992), and Smith et al. (1991). Supply chain participants operating in environments characterized by high levels of uncertainty require greater information-gathering and processing capabilities to achieve optimal performance, as evidenced by the research of Bode et al. (2011). As the volume of data managed by the supply chain grows, their reliance on information processing increases, necessitating the involvement of various stakeholders, as highlighted by Galbraith (1977) and Srinivasan and Swink (2018). OIPT offers a robust framework for understanding how companies process information and how this affects their behavior. Gattiker and Goodhue (2004) identified several sources of uncertainty that can impact supply chain information processing, including hierarchical reference and standard operating procedures, the dynamic nature of the supply chain environment, and the interconnectedness of subunits.

Bibliometric analysis is a powerful tool for evaluating and mapping the landscape of scientific research (Donthu et al., 2021). It involves the application of quantitative methods to analyze academic literature, providing insights into the development, structure, and dynamics of research fields (Ellili, 2022). Citation analysis, for instance, helps map the intellectual structure of a research field by examining how frequently others cite papers (Zupic & Čater, 2015). Co-citation analysis, on the other hand, identifies clusters of related research by analyzing how often two papers are cited together (Greener, 2022). Several software tools have been developed to facilitate bibliometric analysis, VOSviewer excels in visualization and supports data from multiple sources (Moral-Muñoz et al., 2020).

3. RESEARCH METHODOLOGY

3.1. Research methods

This study conducted a systematic and scientific evaluation of the literature. For this purpose, we first considered the widely used electronic database WoS. To our knowledge, WoS is the world's oldest, most commonly used, and most authoritative research publication and citation database (Birkle et al., 2020). It includes many high-quality peer-reviewed articles related to OIPT, and we initially prioritized the Boolean search, phrase search, and fuzzy search provided by the WoS website itself. Our keyword list includes: "organizational information processing theory" and "supply chain management". Afterward, we combined the results above and used VOSviewer and Scimago Graphica as tools to convey and present the literature review results intuitively.

This study utilized the VOSviewer bibliographic coupling technique to map citations. Various units of analysis, such as journals, publications, and authors, can be employed in this type of analysis (van Eck & Waltman, 2010). For this study, publications were chosen as the primary unit of

analysis (Zhao & Strotmann, 2008). Scimago Graphica is utilized for geographic visualization image drawing (Hassan-Montero et al., 2022).

The resulting dataset was then exported and analyzed using VOSviewer, which offers various visualization techniques. For this study, network visualization was employed to present the findings comprehensibly. The bibliometric maps generated through network visualization consist of items and links, representing the interconnections between various elements. Scimago Graphica is an application that uses graphical representations to analyze and explore data. It facilitates visual communication through interactive and responsive visualizations that may be uploaded online (Hassan-Montero et al., 2022). The tool integrates a graphic grammar engine that generates the most accurate visualization by specifying which visual attributes to encode the variables. Subsequently, it provides explanations of the bibliometric keywords used throughout this study:

- Items: represent the objects of interest in the research. The label size and circle associated with each item reflect its occurrence frequency.
- Links: establish connections between elements within the confines of a given research paper. The strength of each connection reflects the frequency of linkage between two components.
- Clusters: sets of interconnected elements are represented with identical colors. The clustering process is accomplished through a modified and parameterized form of the proposed modularity-based clustering method.

Various theories have been employed in previous studies on SCM, such as the resource-based view, transaction cost economics, institutional theory, social network theory, and contingency theory. The resource-based view typically elucidates how companies achieve a sustainable competitive advantage through effective resource management, while transaction cost economics clarifies decisions related to outsourcing. Institutional theory explains how external environments influence organizations, and social network theory analyzes relationships between firms and partners. Contingency theory describes how firms can adapt to different situations and environments in the supply chain (Barney et al., 2001; Williamson, 1979; Scott, 1987; Kadushin, 2004; Donaldson, 1995). In recent years, supply chain research based on the OIPT theory has gained prominence.

Past studies utilized quantitative analyzes, examining keyword co-occurrence frequencies to cluster themes and trace subject knowledge evolution. This method, pioneered by Callon et al. (1991) and Law and Whittaker (1992), allow for observing research focus based on keyword correlations. In this study, we analyzed keyword distribution, considering terms from titles, abstracts, and keywords. Co-occurrence unveils patterns and predicts emerging areas, aiding in identifying unexplored topics and research hotspots. The OIPT and SCM fields encompass diverse issues evident in extensive keywords.

3.2. Data collection

A literature review was used to create the database to serve as the foundation of the bibliometric analysis. On the 19th of July, 2023, the research information systems (RIS) format was performed on the WoS database. The following are the search parameters (van Eck & Waltman, 2010):

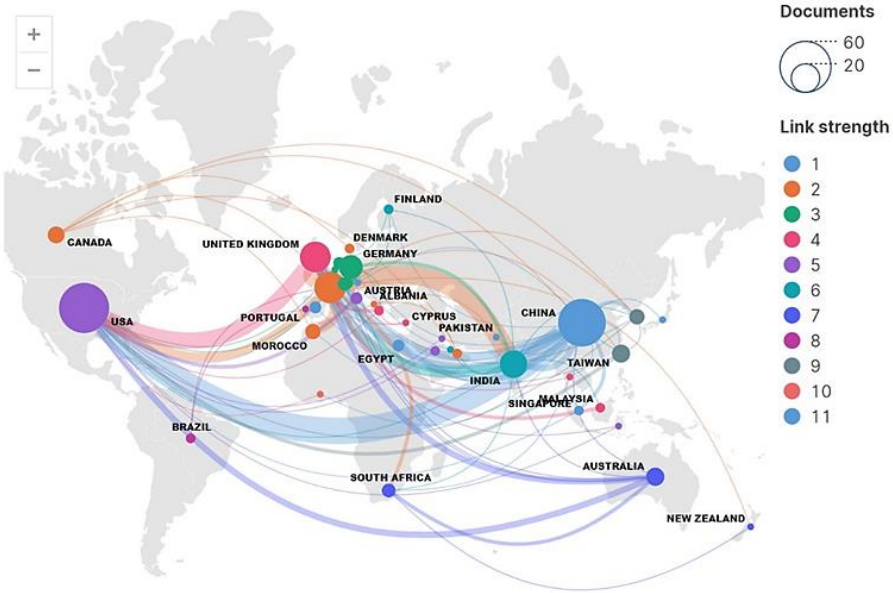
- The keyword research parameters are encapsulated in the following Boolean expression for the WoS database: “organizational NEAR/1 information NEAR/1 processing NEAR/1 theory” or “OIPT (topic) preprint citation index”.
- The time frame for a more comprehensive understanding of the evolution of literature was not restricted.
- After applying the designated filters, 142 papers were recognized in the WoS core collection.

The field of the results was not restricted because, based on the search results, all the OIPT results are associated with domains such as business, management, economics, engineering, and decision-making. As a result, this comes within the scope of the current study. Based on the examination of results in WoS (core collection), the following visualization Figure 2 may be obtained:

Figure 2. Analysis results of publications selected from the WoS core collection

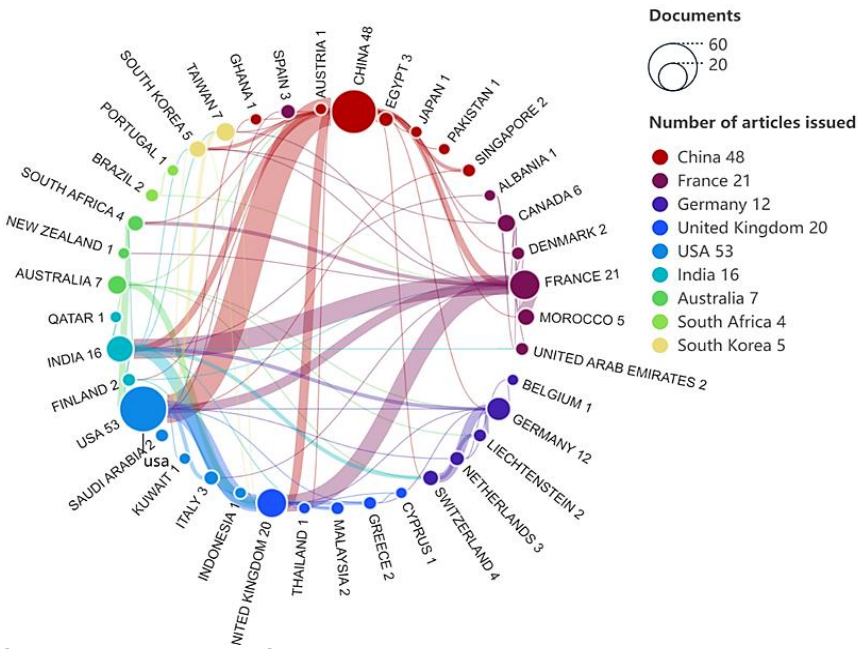
Although the figure's listed papers demonstrate overlapping disciplinary scopes, however, in terms of disciplinary distribution, approximately 78.9% of the articles of the paper on OIPT belong to the field of Business Economics (112), followed by the fields of Engineering (72), Computer Science (62), and Operations Research Management Science (28). As a result, OIPT is still primarily found in business and economic research applications. Meanwhile, specific information regarding author affiliations, publication output, and citation counts can be visualized using the Scimago Graphica tool, as illustrated in the following Figure 3 and Figure 4 countries and regions in terms of the number of research publications and the research linking strength of the study, as shown in the figure, the lines are progressively colored to indicate the degree of correlation in the strength of the study. The correlation between Chinese and American scholars under this research category is vital. Furthermore, it is evident from the figure that European and Indian academics exert significant influence within this realm of study.

Figure 3. Research correlation analysis



Source: Authors' elaboration using Scimago Graphica.

Figure 4. Number of articles issued analysis



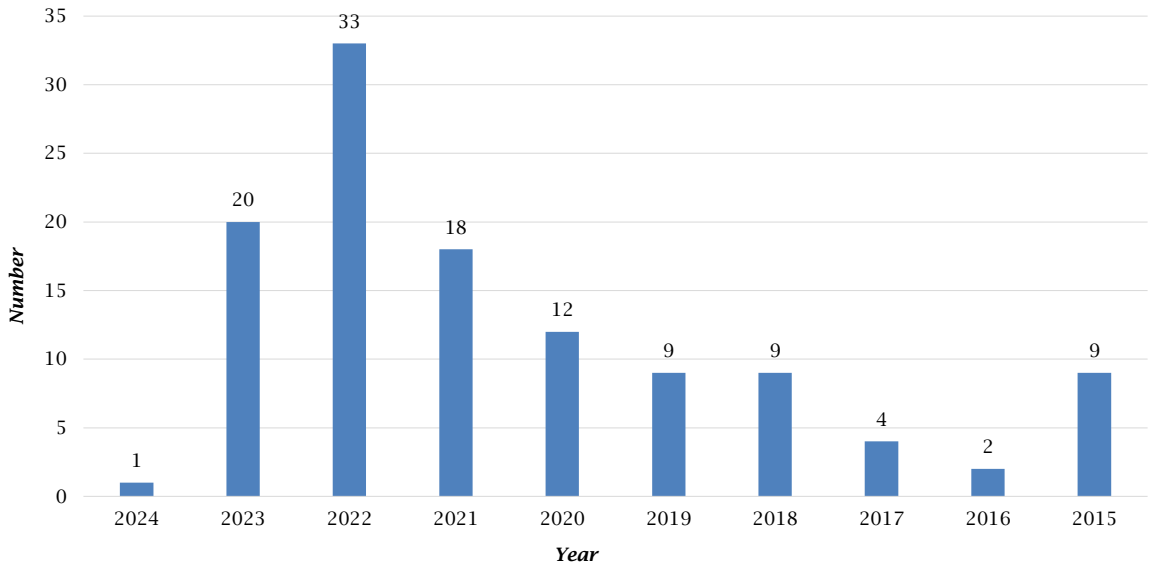
Source: Authors' elaboration using Scimago Graphica.

Table 1. Ranking of the most prolific countries according to the number of articles

Country	*Documents*	*Citations*	*Total link strength*
China	48	1575	43
USA	53	4079	41
France	21	1231	39
United Kingdom	20	1468	38
India	16	232	30
Germany	12	396	16
Australia	7	100	13
Switzerland	4	100	10
Morocco	5	349	8
South Korea	5	65	8

The bibliometric analysis of this study reflects a global research landscape characterized by multinational authorship patterns, where publication counts by national affiliation exceed the total article volume due to collaborative co-authorships. As evidenced in Table 1, the 142 articles on OIPT indexed in the WoS core database represent contributions from authors affiliated with institutions across 43 countries. It is important to note that the data reflects author affiliations, not necessarily the author's nationality. Publications with at least one author affiliated with a U.S. institution numbered 53, ranking first, while those with Chinese author affiliations totaled 48, ranking second. Authors from the two countries together contributed 71% of publications. France contributed 21 publications. In terms of citation impact, publications with U.S.-affiliated authors received 4079 citations, maintaining the top position, followed by those with Chinese-affiliated authors at 1575 citations, and publications with U.K.-affiliated authors at 1468 citations.

Figure 5. The number of OIPT papers published in WoS during the previous decade



Second, as shown in Figure 5, querying the WoS database shows that the relevant literature using the OIPT theory totaled 117 articles from the post-2015 period to early 2024, with the highest number of publications in 2022, totaling 33 articles, and the number continues to increase.

4. RESULTS

4.1. Co-occurrence analysis of the SCM literature use of OIPT theory

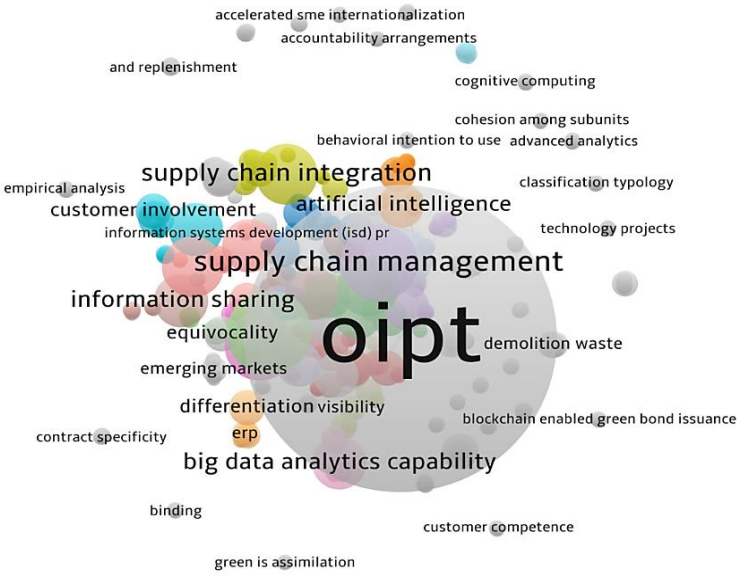
The analysis includes top keywords, co-occurrence networks, and timelines for a comprehensive overview of the SCM literature use of OIPT theory. In bibliometric keyword co-occurrence analysis, there are two main models, KeyWords Plus and Author Keywords, which are commonly selected as units of study. Author Keywords, supplied by the original authors, and KeyWords Plus, derived from the titles of referenced works by Thomson Reuters. KeyWords Plus, produced through automated computational algorithms, comprises terms or expressions recurrent in the titles of references cited within an article, distinct from the article title or Author Keywords (Zhang et al., 2016). we are employing VOSviewer with specific operational steps:

- The WoS database was queried with the Boolean expression "Organizational NEAR/1 information NEAR/1 processing NEAR/1 theory or OIPT and supply NEAR/1 chain (topic) preprint citation index".
- The identification span was unrestricted to ensure a comprehensive view of the evolution of literature. However, data extraction was confined to the WoS core database, as in the previous steps.
- After applying specified filters, 137 papers were identified in the core collection of WoS.

In this section, the researchers conduct a co-occurrence analysis using all keywords (including authors' and KeyWords Plus). Figure 6 shows that the main research areas of OIPT literature are known. The dataset contains 142 documents, with 502 keywords from authors. The criterion for the minimum occurrence of keywords is set to one, and all author's keywords meet this standard. In the visualization, larger circles represent the importance of publications or higher importance (van Eck & Waltman, 2010). These keywords will be

further elaborated on and visualized in the next section, revealing a complex network with multiple links and a cumulative link strength of 3656. The node size in the visualization and the corresponding keywords reflect their respective weights, whereas larger nodes represent higher weights proportional to the relevant terms. In addition, as shown in the visual analysis of author keywords, in addition to OIPT itself, supply chain-related topics are also very prominent. Regarding robustness, the co-occurrence of SCM and OIPT research shows a strong correlation, which explains why many SCM studies use OIPT theory as their theoretical framework.

Figure 6. Cluster visualization map of co-occurring keywords



Source: Authors' elaboration using VOSviewer.

Overall, OIPT has received much attention from scholars. OIPT has become an essential theory for gaining competitive advantage through information, especially when companies face high uncertainty. It has been applied in various fields, including SCM, to help organizations understand how to handle information and make wise decisions effectively. In the next section, we will present relevant research on the application of OIPT in SCM.

4.2. Co-occurrence analysis: KeyWords Plus model

Table 2 below presents the top keywords in the VOSviewer, their respective frequencies, and total link strengths. Notably, apart from keywords such as OIPT and supply chain itself, the keyword "management" has the highest total link strength (236), followed by "impact" (201), "performance" (190), "innovation" (129), "firm performance" (126), "integration" (119), "design" (118), "strategy" (78), "capabilities" (73) and "model" (68).

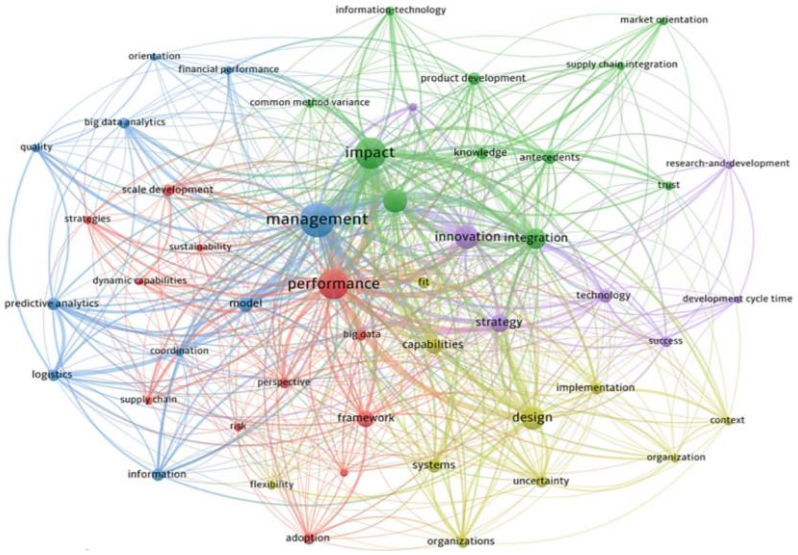
Table 2. Co-occurrence in the model of KeyWords Plus

Keyword	*Occurrences*	*Total link strength*
Management	53	236
Impact	45	201
Performance	43	190
Innovation	29	129
Firm performance	29	126
Integration	23	119
Design	28	118
Strategy	19	78
Capabilities	17	73
Model	14	68

In the context of keyword analysis, the occurrences attribute denotes the frequency with which a given keyword is present across a corpus of documents, representing the tally of documents within which said keyword is identified (van Eck & Waltman, 2011). Bibliometric analyses concerning the configuration of scientific disciplines ought to incorporate KeyWords Plus as a crucial component (Zhang et al., 2016).

The KeyWords Plus terms exhibited greater breadth in their descriptive capacity. In bibliometric analyses delving into the knowledge framework of scientific domains, KeyWords Plus proves to be equally efficacious as Author Keywords. As shown in Figure 6, The dataset consists of 137 documents, resulting in 484 keywords by the KeyWords Plus model in a unit of analysis. A minimum occurrence threshold of five was set to ensure relevance, resulting in 50 keywords meeting this criterion. These keywords are visualized in the Figure 7 below. The weights of the nodes and words are reflected in their sizes, with larger sizes indicating higher weights. Their distance represents the degree of the link between nodes; closer closeness denotes a stronger correlation. A line joining them shows the co-occurrence of two terms in the dataset. VOSviewer identified five distinct clusters within the ethics and innovation-related publications. Cluster 1 (12 items), depicted in red, includes keywords such as adoption, performance, big data, etc. Cluster 2 (11 items), represented in green, comprises keywords like antecedents, integration trust, etc. Cluster 3 (10 items), shown in blue, encompasses keywords such as logistics, management, coordination, etc. Cluster 4 (10 items), visualized in yellow, includes keywords like capabilities, fit, uncertainty, etc. Cluster 5 (7 items), visualized in purple, includes keywords like innovation, technology, strategy, etc.

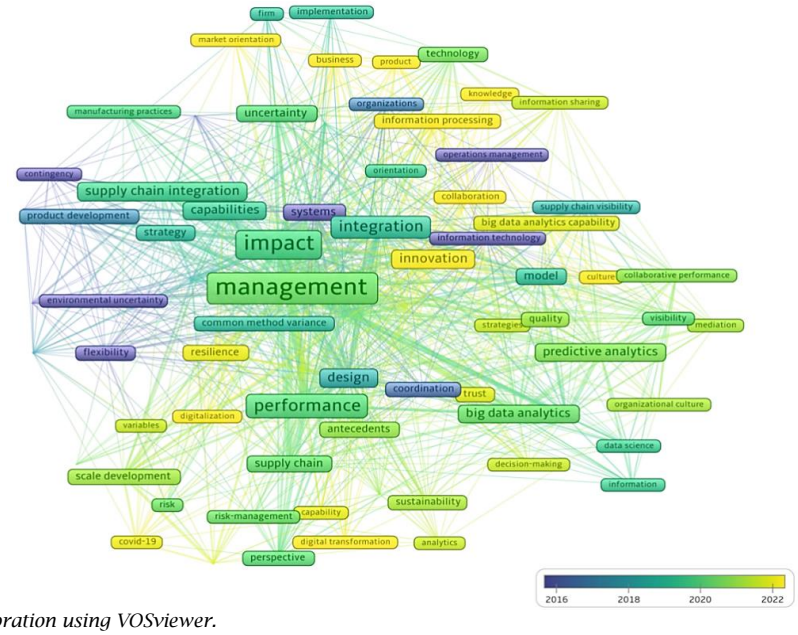
Figure 7. Co-occurring term cluster visualization map



Source: Authors' elaboration using VOSviewer.

As shown in Figure 8, Utilizing VOSviewer to generate an overlay visualization network, the color-coded keywords demonstrate the evolving research theme of OIPT in SCM from 2016 to 2022. In the illustration, the lighter the color, the more recent the timestamp when keywords appear. Over this period, the research trajectory of OIPT has displayed remarkable expansion and diversification across diverse domains. Initially confined to traditional supply chain team organization theory, the scope of OIPT research has progressively broadened to encompass a wide array of business fields. Notably, integrating OIPT with emerging technologies exemplifies its growing relevance and adaptability in tackling contemporary SCM challenges. This dynamic evolution underscores the continuous growth and adaptability of OIPT, transcending conventional boundaries and venturing into new areas of exploration while synergistically incorporating emerging technologies to enhance supply chain performance and efficiency.

Figure 8. Overlay visualization map for co-occurring keywords



Source: Authors' elaboration using VOSviewer.

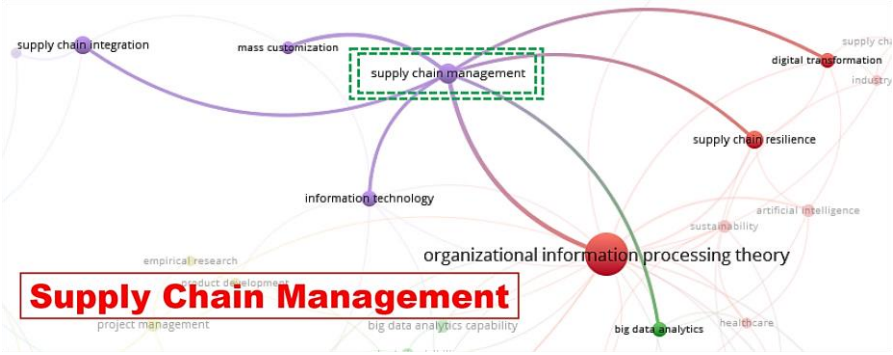
Notably, this chapter, through a bibliometric co-occurrence analysis of the "KeyWords Plus", identifies "management" as a central theme in applying OIPT to SCM, surpassing other keywords in co-occurrence frequency. This emphasizes the crucial role of managerial perspectives in integrating OIPT within supply chain processes. Additionally, to balance comprehensiveness and clarity in the results, a threshold of at least three occurrences per author keyword was established, leading to 14 out of 503 keywords meeting this criterion. The analysis also highlights the significance of co-occurrence in bibliometric studies to uncover research interconnections (Sedighi, 2016).

4.3. Bibliometric co-occurrence analysis: Author Keywords model

Next, we will explore the bibliometric analysis under the Author Keywords model. Previous KeyWords Plus terms prioritized elucidating research methodologies and techniques, whereas Author Keywords concentrated on delineating specific domains and conditions (Zhang et al., 2016). Some keywords were noticed when analyzing the maps of Author Keywords.

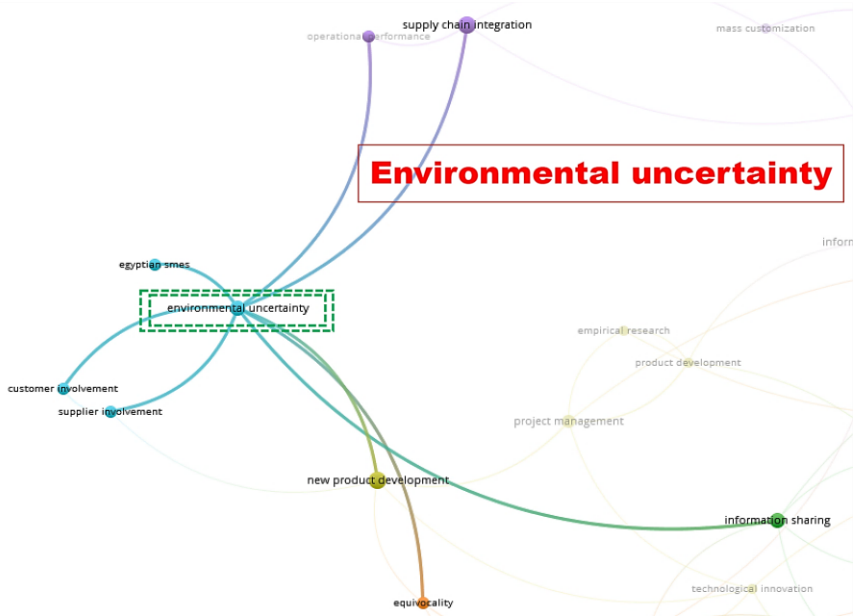
A co-occurrence analysis of SCM based on bibliographic data is displayed in Figure 9. We can see that the author's keywords co-occurrence is highly relevant to supply chain integration, supply chain resilience, and digital transformation. This also responds to several aspects of applying the OIPT theory in SCM research, fitting the points emphasized by the theory. Enhance the efficiency of the overall functioning of the SCM by increasing the level of integration of the supply chain, thereby reducing the complexity of information. Enhancing the information processing capability through the digital transformation of the SCM, which also improves the efficiency of the entire process, is a key point emphasized by SCM research based on the OIPT theory.

Figure 9. Co-occurrence analysis with an emphasis on "Supply chain management" co-occurrence relationships based on bibliographic data



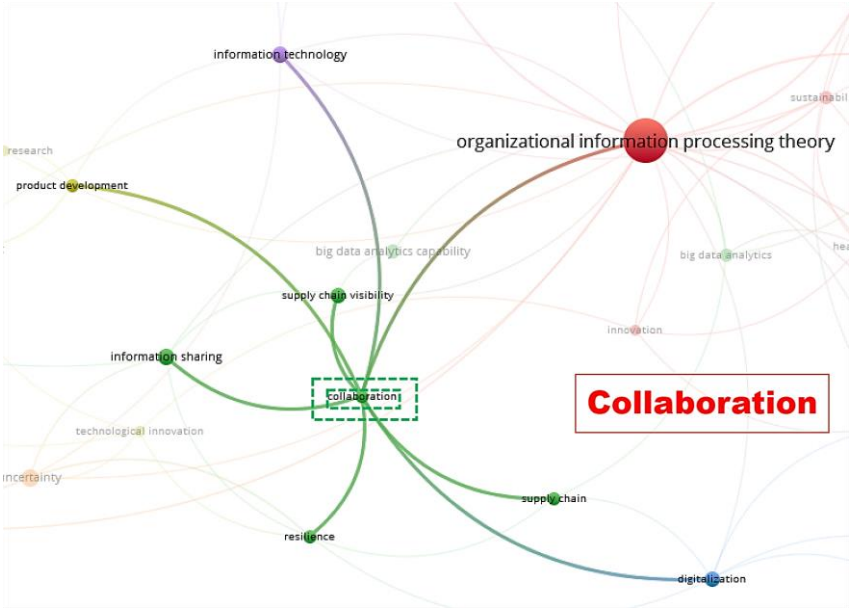
More related to environmental uncertainty in Figure 10: complex and unexpected elements that might affect the supply chain are called environmental uncertainty in SCM. Changes in integration, information exchange, operational performance, and other aspects may thus be among these determinants (Inman & Green, 2021; Vachon & Hajmohammad, 2016). The level of engagement from suppliers and consumers is among the most critical factors. When both parties can effectively participate in the decision-making process of the supply chain, it may significantly minimize supply chain uncertainty. Naturally, increasing the level of information exchange within the supply chain can also help lower the uncertainty level that the chain confronts.

Figure 10. Co-occurrence study using bibliographic data with an emphasis on co-occurrence relationships related to "Environmental uncertainty"



Finally, "collaboration" in Figure 11 is highly related to supply chain transparency, IT and product development, and information sharing. In the OIPT literature, we analyze these links through co-occurrence, which allows us to infer that for the keyword "cooperation", we can see that in the future, the prerequisite for better cooperation between supply chains is to enhance the transparency of supply chains, to improve the degree of IT and to enhance the strength of information sharing, which will vastly increase the resilience of supply chains and at the same time effectively avoid the occurrence of supply chain incoordination phenomena such as bullwhip effect and the double-marginal effect. This can vastly increase the supply chain's resilience and, at the same time, effectively avoid the occurrence of supply chain incoordination phenomena such as the bullwhip effect and double marginal effect.

Figure 11. Co-occurrence analysis using bibliographic data: emphasize co-occurrence linkages related to "Collaboration"



This chart shows that based on the bibliometric co-occurrence analysis of author keywords, this study reveals the high-frequency co-occurrence terms associated with the core concepts of "supply chain", "environmental uncertainty", and "collaboration". These insights offer valuable guidance for future researchers to identify the focal areas and emerging trends within this research domain.

5. DISCUSSION

Emerging technologies: Three of the most typical emerging technologies that are currently integrated with the supply chain, such as blockchain, AI, and the IoT (Chilamkurti et al., 2021), are increasingly crucial for SCM development due to their ability to enhance efficiency, visibility, and collaboration in the supply chain (Rejeb et al., 2021).

AI can analyze large volumes of data in real time to identify trends, optimize inventory management, and improve demand forecasting (Dash et al., 2019). This can help companies better understand customer needs and preferences, reduce stockouts, and improve customer satisfaction. IoT can collect and transmit data from sensors and devices throughout the supply chain (Whitmore et al., 2015). This can enable real-time tracking of goods and shipments and better monitoring of equipment performance and maintenance needs. BT can be used to create a secure and transparent digital ledger that can be used to track and verify the provenance of goods as they move through the supply chain (Khan et al., 2020). This can improve supply chain visibility and traceability, making detecting and preventing fraud easier, improving quality control, and reducing costs.

In light of these transformative potentials, comprehending the intricacies of future research imperatives becomes imperative for scholars and practitioners alike. To facilitate this understanding, Table 3 provides a comprehensive synthesis of future research guidelines, encapsulating the review of highly cited literature based on relevant content across four critical domains: methodology, data collection, results, and variables. These guidelines serve as a roadmap for empirical investigations within SCM and emerging technology, mainly focusing on the intersecting domains of BT, IoT, and AI. By elucidating key considerations and methodological nuances pertinent to each research cluster, Table 3 furnishes several questions that elucidate the path toward advancing scholarly discourse and practical applications in this burgeoning field.

The confluence of SCM and emerging technology represents a nexus of innovation and opportunity, redefining the contours of supply chain dynamics in an increasingly interconnected global landscape. Through diligent scholarship and strategic implementation, stakeholders can harness the transformative power of these technologies to foster a future wherein supply chains are efficient and effective, resilient, sustainable, and adaptable to the evolving exigencies of the modern world.

Table 3. Future research guidelines

Authors	*Future research guidelines*
Methodological	
Giri and Manohar (2023), Dubey et al. (2020)	1. What qualitative measurements can be employed to obtain more authentic responses when investigating operational challenges in system design? 2. How can we effectively advocate for using mixed-methods research comprehensively in future studies?
Birkel and Hartmann (2020)	3. How can investigating specific sections within the supply chain, considering collaborative efforts among companies in supply chain risk management (SCRM), and conducting large-scale empirical studies with cross-sectional data enhance our understanding?
Cegielski et al. (2012)	4. Hods for validating qualitative findings, and what strategies can be employed to broaden the scope of the study to encompass diverse types of organizations and countries? 5. How can future research enhance its methodology by prioritizing the application of quantitative met?
Behl et al. (2022)	6. Can exploring alternative theoretical frameworks address potential construct gaps beyond OIPT and IT?
Belhadi et al. (2021)	7. How can future research utilize mixed methods, emphasize the importance of longitudinal studies to confirm connections between AI, supply chain resilience (SCRes), and supply chain performance (SCP) after COVID-19, and extend inquiries to diverse sectors for broader generalization?
Gallo et al. (2023)	8. What methodologies can be employed to explore the moderating role of green supply chain collaboration (GSCC), taking into account factors such as stakeholder pressure?
Variables	
Giri and Manohar (2023)	1. How do personality factors influence blockchain-based collaboration in SCM, specifically focusing on the experience factor as a potential moderator?
Dubey et al. (2020), Yang et al. (2020)	2. How does organizational culture interact with and influence the relationships among BT and other factors?
Shi et al. (2023)	3. What strategies should be employed to assess the factors contributing to the development of supply chain resilience, with a particular focus on constructs measuring supply chain restructuring capabilities?
	4. What avenues can future research pursue to expand the understanding of the link between big data analytics capability (BDAC) and green supply chain integration (GSCI) by investigating additional mediators and contingency factors, with a specific focus on elements such as green entrepreneurial orientation, intellectual capital, organizational learning capability, and external pressures?
Gallo et al. (2023)	5. What methodologies can be employed to investigate the moderating effect of GSCC on the relationship between big data analytics and artificial intelligence (BDA-AI) and environmental performance (EP) under different GSCC levels?
Enrique et al. (2022)	6. How might researchers consider internal uncertainties such as manufacturing and control, and what methodologies can be employed to examine the role of digital transformation in promoting sustainability within the context of uncertainty?
Results	
Saberi et al. (2019)	1. How can future research effectively address the environmental and social aspects of sustainability within the context of blockchain-enabled supply chains?
Zhu et al. (2022)	2. How can these studies contribute to theory-building in this field?
Shayganmehr et al. (2021)	3. How can future research automate and accelerate the framework using data mining algorithms within aid organizations' databases to enhance reliability and accuracy and provide more logical results for decision-makers?
Shayganmehr et al. (2021)	4. How can future research automate and accelerate the framework using data mining algorithms within aid organizations' databases to enhance reliability and accuracy and provide more logical results for decision-makers?
Gallo et al. (2023)	5. What strategies can be implemented to validate results with diverse samples?
Data collection	
Saberi et al. (2019)	1. What transdisciplinary efforts and collaborations with professional organizations are necessary to establish standards and practical performance measurements for implementing blockchain (BT) in supply chains?
Zhu et al. (2022)	2. How can future research delve deeper into understanding how analytical, theoretical frameworks can aid in operationalizing, implementing, and evaluating disruptive technological use, specifically BT?
Yang et al. (2020)	3. How can future studies be designed to conduct cross-country surveys that capture regional diversity, economic development, culture, and healthcare systems?
Birkel and Hartmann (2020)	4. How can future research be improved by exploring additional industries and conducting more interviews within companies for validation?
Cegielski et al. (2012)	5. How might researchers validate or extend existing models by utilizing different sample profiles in future studies?
Behl et al. (2022)	6. How can future research enhance its methodology by incorporating cross-cultural data for validation, and implementing simple random sampling to enhance generalizability?
Shi et al. (2023)	7. How can research extend its scope beyond Chinese manufacturers to ensure broader generalizability and facilitate cross-cultural exploration of these dynamics?
Gallo et al. (2023)	8. How can researchers evaluate the effectiveness of BDA-AI in enhancing EP within green operations?
Enrique et al. (2022)	9. What avenues can future studies pursue to investigate the contributions of smart workers to flexibility in manufacturing, and how can these findings be integrated with the social perspective of supply chains?

6. CONCLUSION

This bibliometric review highlights the increasing importance of OIPT in SCM research, 142 articles on OIPT have been published in the WoS core database (July 2023), particularly within Business Economics (78.9%). The USA leads in publication volume and citation count, reflecting its significant influence in the field. The research landscape shows a marked growth, with 2022 having the most publications and a strong co-occurrence of "SCM" and "OIPT", underscoring OIPT's role as a key framework in SCM studies.

Keyword analysis reveals that "management" is central to integrating OIPT into SCM, alongside high-frequency terms like "supply chain", "environmental uncertainty", and "collaboration". These findings offer valuable insights for future research directions. Additionally, integrating emerging technologies with OIPT showcases its adaptability in tackling contemporary SCM challenges, enhancing performance and efficiency.

According to the results, the convergence of SCM and emerging technologies presents a fertile ground for innovation, underscored by the significance of OIPT. Through focused research and strategic implementation of OIPT principles, stakeholders can harness the potential of these advancements to create efficient, resilient supply chains that adapt to the dynamic challenges of the modern world. By leveraging OIPT, organizations can enhance their decision-making capabilities, optimize information flow, and foster collaboration among supply chain partners, ultimately driving sustainable and competitive performance.

As one of the few studies on this topic, this bibliometric review highlights the pivotal role of OIPT in advancing contemporary SCM research, especially in light of emerging technologies (IoT, AI, blockchain, etc.). Future research should delve into strategies for managing uncertainty within SCM, leverage OIPT to understand the impact of emerging technologies on supply chain dynamics and investigate the role of managerial innovation in fostering sustainable supply chain practices.

Like any bibliometric review, this study has certain limitations. Firstly, it focused on business economics, and exploring diverse disciplines might yield different results. Generalizing the findings beyond business economics requires caution. The temporal scope (up to 2023) may not capture evolving technologies and topics, impacting conclusions. Additionally, reliance on the WoS database poses inherent limitations, suggesting the need for future analyses using diverse sources like Scopus. Additionally, researchers can employ the latest systematic bibliometric tool, Altmetrics, to assess research outcomes' academic and societal impact. This tool, used in conjunction with bibliometric analysis, can further elucidate the dynamics of the field and identify new research areas. Despite these limitations, this study's comprehensive literature review and bibliometric data analysis contribute to ethical construction and innovation research.

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