

# Nano-Revolution: IT and Supply Chain Integration in Middle East Small Retailers

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*The study's objectives encompass understanding the impact of IT and SCI on nanostore performance and introducing a novel methodological approach using VOSviewer. It underscores the need for further research in these domains, especially in developing nations. The implications of the research guide nanostore managers and policymakers in leveraging IT and SCI for operational enhancement. The study also predicts societal shifts in attitudes, service quality, and quality of life. The research reveals trends, geographic gaps, and a novel approach. Practical applications and policies that shape the nanostore landscape and social well-being.*

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## I. INTRODUCTION

Nanostores have attracted considerable interest within the retail industry due to their distinctive characteristics, particularly their reduced size and localized range of services. This new business model has gained recognition for its unique approach. Many academics worldwide are investigating the uncover effective methods for improving nonostores operational performance [1]. For example, the adoption of the Supply chain integration (SCI) has increased as competition has shifted its focus from individual companies to supplier networks. SCI refers to the process of connecting and aligning different components and entities within a supply chain to improve coordination, collaboration, and overall efficiency [2]. SCI plays a vital role in enhancing operational performance by providing better visibility, efficient planning, streamlined communication, improved responsiveness, and cost reduction [3]. The importance of SCI to nanostores' operational performance stems from the flow of information, materials, and resources that enables better coordination and responsiveness of these stores Furthermore, it has been demonstrated that both internal and external SCI initiatives have variable degrees of impact on key performance measurements [4]. By aligning and

integrating the various elements of SC, nanostores can achieve operational performance and gain a competitive advantage in the marketplace.

SCI involves integrating various functions, processes, systems, and stakeholders involved in the production, distribution, and delivery of goods or services. SCI also involves both internal integration within an organization and external integration with external partners, such as suppliers, manufacturers, distributors, retailers, and customers [5][6]. Internal integration involves integrating different departments or functions within an organization, such as procurement, production, inventory management, logistics, and sales. Internal integration ensures that information flows seamlessly between these departments, facilitating effective decision-making and resource allocation, while external integration focuses on establishing strong relationships and information sharing with external partners throughout the supply chain [7][8].

Another essential component is the implementation of information technology (IT). As the retail industry becomes increasingly digital and consumer preferences shift towards seamless experiences, the role of IT in influencing nanostore performance becomes crucial. IT is employed to improve the customer experience at nanostores by simplifying tasks such as placing orders and conducting transactions [9]. This may involve adopting technologies, such as electronic data interchange (EDI), enterprise resource planning (ERP) systems, and supply chain management (SCM) software, to facilitate real-time data exchange and collaboration. Several studies have emphasized the need to integrate both internal and external providers and customers [10].

Nanostores, distinguished by their compact size and localized services, have ignited significant interest in the retail industry due to their unique business model. As researchers and practitioners strive to enhance nanostores' operational performance [11], two pivotal factors have emerged as focal points: Supply Chain Integration (SCI) and Information Technology (IT). SCI involves the alignment and linkage of supply chain components to foster coordination, collaboration, and operational efficiency [12]

making it a vital element for optimizing nanostores' performance in today's evolving retail landscape. Simultaneously, the integration of IT is gaining prominence as the retail industry embraces digital transformation to cater to consumer preferences for seamless experiences [9].

Nevertheless, a noticeable research gap has surfaced, notably the limited attention paid to bibliometric analysis in this context. Despite the mounting emphasis on SCI and IT, a

comprehensive examination of existing literature utilizing bibliometric techniques remains conspicuously absent. This gap signifies a realm yet to be explored, where the intricate interplay, trends, and research voids connecting SCI, IT, and nanostore operational performance remain uncharted. Consequently, this study seeks to address this void by employing visualization analysis through the VOSviewer software. Through this approach, the research aims to unveil the multidimensional aspects of the existing literature, thereby fostering a more nuanced comprehension of the dynamics and uncovering novel avenues for exploration.

#### A. Research Questions and Objectives:

This research is guided by the following research questions, derived from the identified gap and the context of SCI, IT, and nanostore operational performance:

1. How does Supply Chain Integration (SCI) contribute to the enhancement of operational performance in nanostores?
2. What role does Information Technology (IT) play in augmenting nanostores' operational efficiency and customer experience?
3. What are the existing trends, research relationships, and gaps within the literature at the intersection of SCI, IT, and nanostore operational performance?

To address these questions, the specific research objectives are as follows:

1. To investigate the mechanisms through which Supply Chain Integration (SCI) influences the operational performance of nanostores.
2. To analyze the impact of Information Technology (IT) integration on enhancing both operational efficiency and customer experiences in nanostores.
3. To employ visualization analysis using VOSviewer software to map and understand the evolving research landscape surrounding SCI, IT, and nanostore operational performance.
4. To identify gaps in the literature and propose potential directions for future research in the domain of SCI, IT, and nanostore operational performance.

Through these research questions and objectives, this study aims to contribute to both theoretical advancements and practical insights, offering a comprehensive understanding of the transformative roles of SCI and IT in enhancing nanostore operational performance.

## II. LITERATURE REVIEW AND PROPOSALS

### A. Operational Performance of Nanostores

The evaluation of company's operation has consistently attracted attention from leaders and researchers. In addition, monitoring the performance of businesses in the current economic climate is an important topic for both academic

scholars and managers who are actively working in the field. The efforts of researchers to find measurements for the idea of performance have been stepped up recently. Operational performance was defined in the first decade of the twenty-first century as the degree to which an organization was able to effectively and efficiently use its resources to produce results that were both in line with its stated goals and of value to its customers. The assessment of operational performance in the context of nanostores implies the measurement of multiple factors and indicators to evaluate the efficiency with which these tiny retailers carry out their daily activities and processes [13].

Better operational outcomes and operational performance are both strongly predicted using cutting-edge practices. This agrees with previous studies' findings that sustainability policies promote improvements to the design of products and processes and enhance organizational learning, which in turn results in permanent benefits in performance [12] [13]. A business that demonstrates strong performance has the potential to yield significant and durable profits, generating opportunities for labor and enhancing individuals' income levels.

Therefore, conducting research into the key factors that are associated with operational performance, particularly in nanostores, enables us to acquire knowledge of the proper measures to enhance the level of operational performance of these stores [14].

### B. Supply Chain Integration (SCI)

Since the mid-1990s, several research papers have been published to address the strategic component of supply chain and examine the empirical relationships between various characteristics of SCI and various performance measures [12]. SCI related literature includes several different but interrelated definitions of SCI [15]. According to [16], the lack of a clear and singular legal definition of SCI makes prescribing practical answers about what to integrate, the costs, and the advantages of integration challenging. Similarly, an agreed-upon definition of SCI will help in theory development and consensus in SCI literature. Since then, SCI has evolved to focus on approaches that increase a company's overall value by optimizing how resources are used and deployed within the organization [17]. Based on the prior argument, SCI might help in reaching the benefits of an interactive link between the SCI and the operational performance of nanostores, which has been crucial in overcoming this obstacle.

Nanostores have grown significantly, especially during the Covid-19 pandemic [18][19]. According to [20], they are now the largest channel for selling consumer packaged goods (CPG), as they account for 40-70% of the market share. [21] estimated that there are approximately 50 million nanostores operating in different countries. There are over 12 million located in India, 6 million in China, and millions of nanostores in other developing countries such as Indonesia, Nigeria, Mexico, etc. The market share captured by nanostores varies across markets, depending on the success of modern retail chain operations, both offline and online. In China, for example, due to widespread adoption of smartphones and mobile payments, giants such as Alibaba, JD.com and Pindoudou have lured many

customers to shop online, and organized convenience stores such as FamilyMart, Lawson, and 7-Eleven have entered many cities, encroaching the market share of the nanostores [22]. With the notable exception of China, the market share captured by nanostores has been relatively stable over the past two decades, even though it can vary across neighboring countries.

In addition, because the grocery retail market is saturated in developed economies, many modern retail chains ventured into developing countries to compete with nanostores. By considering the underlying competition between nanostores and supermarkets, [23] found that, with the entry of the modern channel, the number of nanostores would decrease while their prices would increase. Consequently, surviving nanostores would be better off, even though consumer welfare would deteriorate. However, there is no consistent empirical evidence about these claims.

Furthermore, given that each nanostore caters only to a certain group of consumers residing in proximity, the business owners can use their extensive understanding of their customers to determine their needs. In relation to the supply aspect, it is commonly seen that makers of prominent brands, as well as providers of critical perishable items like bread, cooking oil, and milk, serve as the primary suppliers of nanostores in several developing nations. In urban settings, most suppliers opt to directly distribute their products to nanostores, frequently visiting a substantial number of these establishments on a weekly basis inside a densely populated city. To enhance logistics efficiency, producers can collaborate with distributors for items characterized by slow-moving sales or less popular brands [5]. In locations characterized by limited availability of stores, particularly in rural areas, a prevalent practice among manufacturers is to distribute their products through intermediaries known as distributors. In the case of goods, such as fruits and vegetables, it is common for retailers to restock their supplies directly from various wholesale marketplaces. The limitations caused by insufficient infrastructure, ineffective operations, and inadequate financial services restrict the flexibility, comprehensiveness, and effectiveness of nanostore supply chains. Furthermore, the logistical and operational issues associated with nanostores in developing countries vary, depending on whether they are in urban or rural areas.

Several scholarly studies have conducted an empirical examination of different aspects related to SCI [24][25][26][27]. The components of integration that were explored include internal integration inside a business, external integration with customers, and external integration with suppliers. Internal integration refers to the collaborative and information-sharing activities that occur within an organization, including teams from different departments, and are facilitated by integrated and synchronized systems and processes [27]. Accordingly, internal integration measures involve how various elements of an organization, such as operations, transportation, marketing, and sales, collaborate to meet supply chain goals. Moreover, the integration of the supplier base with internal operations and external demand is beneficial for a corporation.

At a greater level, internal integration relates to the characteristics inside the firm, while external integration measures evaluate the degree and nature of the interactions that companies maintain with their business partners both upstream and downstream. The current literature presents several interpretations of the SCI and performance measures. However, the scales that are often employed to evaluate these constructs generally consist of items that assess the degree to which organizations effectively coordinate their internal activities and align them with their partners. The primary components of external integration include supplier integration and customer integration [24][28][29].

A review of 170 studies found that the degree of supply chain did, in fact, increase monetary success. Contrary to popular belief, the operational performance associated with a lower cost positional advantage has a bigger mediating impact than types of intermediate performance connected with a higher customer value positioning advantage. Supply chain and commercial success have a strong correlation because of time, great relationships, and a collectivist national culture, among other factors. We compare our findings to those of past meta-analysis and explain the practical implications of what we have learned about how to effectively use the supply chain. Small and medium-sized businesses (SMEs) in Korea were studied in Lee's to see how supply chain affected their operational performance (OP). Empirical research was conducted on the usage of supply chain approaches by 300 Korean manufacturers. The variables were analyzed using structural equation modeling. Supply chain methodologies and organizational competencies have a significant influence on total business performance, according to the conclusions of this study. SMEs' organizational capacities are also significantly impacted by supply chain strategies [30]. Supply chain strategy's impact on whole business performance was also investigated, as well as the role of organizational skills. The supply chain strategy's impact on operational success was shown to be mitigated by organizational competence, but not on financial performance. There is a pattern of interaction between supply chain operational competency and the corporate competitive capacity for performance improvement, as identified by [31]. It has been shown in previous studies on supply chain and manufacturing strategy that these selections must be strategically linked to the company's business strategy. Based on the above discussion, the key role of SCI in enhancing the operational performance of nano shops is revealed.

### *C. Information Technology (IT)*

The use of information technology (IT) within nanostores has been associated with enhanced operational efficiency and more effective inventory management [9]. Technological advancements, such as the use of point-of-sale systems, inventory management software, and digital payment solutions, provide nanostores the opportunity to streamline their supply chain procedures, mitigate stockouts, and improve overall store operations. Those improvements create more efficient operations and financial benefits, consequently impacting the overall performance of a nanostore.

Furthermore, the integration of IT within nanostores plays a significant role in improving consumer experiences by facilitating individualized interactions and frictionless transactions [32]. Mobile applications, customer relationship management systems, and loyalty programs facilitate the ability of nanostores to comprehend client preferences, deliver personalized suggestions, and facilitate a seamless shopping experience [33]. Additionally, it further enables the implementation of omnichannel strategies, enabling customers to interact with a retailer through many channels.

The adoption of modern technology, such as Internet of Things (IoT) devices and cloud computing, has allowed seamless exchange of real-time data. This has empowered enterprises to effectively monitor inventory levels, trace shipments, and accurately forecast variations in demand with an unparalleled degree of precision [34] [35].

In summary, the relationship between IT adoption and the integration of supply chains has demonstrated its capacity to bring about significant changes in improving operational performance across several sectors. The incorporation of IT systems into supply chain operations has resulted in enhanced transparency, synchronization, and effectiveness across the entirety of the supply chain life cycle. The incorporation of IT systems enables efficient and uninterrupted communication and cooperation among various entities such as suppliers, manufacturers, distributors, and retailers. This capability allows for prompt reactions to disturbances and guarantees a coordinated movement of products. The ultimate outcome of adopting IT and integrating supply chains on operational performance is characterized by the reduction of lead times, decrease in costs, improvement in resource utilization, and an overall increased capacity to satisfy consumer expectations in a dynamic and competitive business environment [36].

#### D. Research Proposals

Through the review of literature, this study could introduce some proposals that serve as a detailed plan describing the strategic implementation of the study objectives. These proposals are as follows: **Proposal 1 - Comprehensive Framework for Supply Chain Integration (SCI):** Given the varying definitions and practical implications of Supply Chain Integration (SCI) [12][13][14], this proposal advocates for the establishment of a comprehensive framework. This framework would encompass the dimensions of both internal and external integration, facilitating a cohesive understanding of how organizations collaborate within themselves and across their partner networks. The framework's development aims to provide a standardized definition of SCI, which in turn can guide theory development and practical implementation. By clarifying the scope and components of SCI, the research will contribute to a more nuanced exploration of its impact on nanostores' operational performance.

**Proposal 2 - Nanostore Competition and Modern Retail Impact:** Claims about the detrimental effects of modern retail expansion on nanostores lack empirical validation [18][19].

Therefore, this proposal recommends a thorough empirical analysis to gauge the actual consequences of modern retail's entry on nanostores. This study would assess the changes in nanostore numbers, pricing strategies, and consumer welfare after the advent of modern retail. By substantiating these claims with empirical evidence, this research will contribute to a well-informed understanding of the competitive dynamics between nanostores and modern retail. Additionally, it can provide insights into the viability of nanostores in the face of evolving retail landscapes.

**Proposal 3 - Addressing Nanostore Supply Chain Challenges:** Recognizing the significance of efficient supply chain networks for nanostores, particularly in resource-constrained settings [5], this proposal advocates for a comprehensive analysis of supply chain challenges across diverse geographic contexts. By understanding

### III. METHODOLOGY

In this study, a systematic review of literature was conducted to examine the effect of supply chain integration on the operational performance of nanostores. However, the study suggests a new methodological approach using a visualization tool VOSviewer, which facilitates the systematic review of literature.

VOSviewer employs advanced mapping techniques to position items (e.g., authors, papers, keywords) in the visualization space. It provides flexible options for importing data from different file formats, such as bibliographic databases or text files. The software allows filtering and highlighting of items based on various criteria, such as publication year, citation count, or keyword occurrence, to focus on specific subsets of data. This enables researchers and analysts to gain insights into the structure, relationships, and patterns within the network data, facilitating knowledge discovery and decision-making [37][38].

In collecting the data, a quantitative bibliometric approach was used to identify previous research. The Scopus database was used to retrieve data from journals published on Scopus by entering the keyword "supply chain, nano store, information technology, and operational performance". Based on these keywords, there were 109 related studies published regarding this topic with a time span of 2015-2023. These studies were analyzed using VOSviewer software into three types of mapping: the network, overlay, and density visualization.

### IV. RESULTS AND DISCUSSION

The analysis of the selected studies was conducted on VOSviewer software. The analysis was performed (1) by applying the Author keywords Co-Occurrence, to show number and the link between studies covering the article topic, and (2) by applying Countries co-authorship to show countries' contribution of all studies.

#### A. Author keywords Co-Occurrence

Three types of visualizations were obtained: network, density, and overlay visualization. Network visualization is a description of the relationship between keywords on the map. Fig.1 shows the network visualization resulting from VOS analysis in this study.

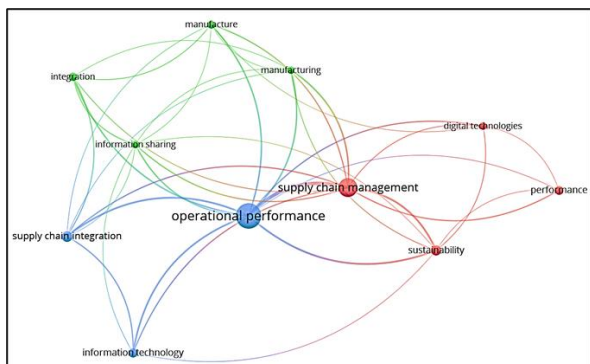


Fig.1 Network visualization – VOS viewer analysis results.

The network visualization in the supply chain - operational performance – information technology image includes different colors that indicate the connection between the keywords. The relationship between the main keywords is shown by a line. On the other hand, the size of each key word circle indicates the focus of literature on this specific term. Fig. 1 shows that Operational Performance has the largest circle, with the highest number of connections to other keywords, while “Supply Chain Integration” and “Supply Chain Management” have smaller circles, which highlights the lack of studies in this area since 2015. Nevertheless, the circle representing information technology was the smallest, suggesting a limited body of studies linking this term to operational performance. It is noteworthy to mention that the keyword "Nanostore" was not observed on the map, suggesting a study area that warrants more exploration by academic researchers.

The second type of analysis is the density visualization analysis, in which each word is categorized based on its level of popularity. In other words, if the keyword demonstrated color is dark or faded, this means that the topic is hardly investigated, whereas if the color is lighter or yellow, the topic is frequently investigated by researchers. Fig. 2 shows the density visualization of the keywords in this study.

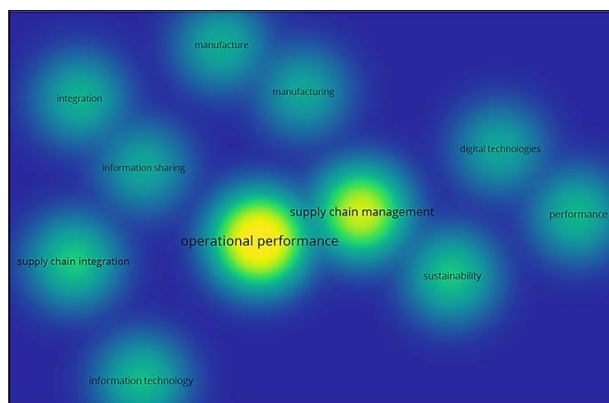


Fig.2 Density visualization – VOS viewer analysis results.

The results of density visualization appear in Fig. 2 are consistent with network analysis and emphasize the lack of studies in the information technology and nanostores area. Table 1 shows the number of studies investigating each author's keyword occurrence and the link strength of each keyword.

TABLE I  
AUTHORS KEYWORD OCCURRENCE ANALYSIS RESULTS

Keyword	Occurrence	Total link strength
Operational performance	81	127
Supply chain management	44	88
Sustainability	13	30
Supply chain integration	14	27
Integration	09	25
Information sharing	07	20
Information technology	11	19
Manufacturing	07	19
Digital technologies	07	17
Performance	10	10

Overlay visualization is the presentation of research subject data according to the range of years examined to map the most recent research topics. Fig. 3 shows mapping in the overlay visualization in the supply chain and operational performance areas from 2015 to 2023.

Fig. 3 suggests that the study was done closer to 2015. Meanwhile, if the color is lightening, the study was around 2023. It can be noticed that both “operational performance” and “Supply chain management” are recent research topics that began to attract the attention of scholars around the year 2020. Fig. 4 also shows research growth with years.

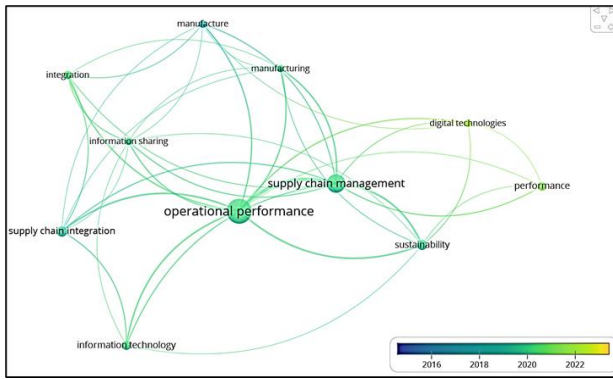


Fig.3 Overlay visualization – VOS viewer analysis results.

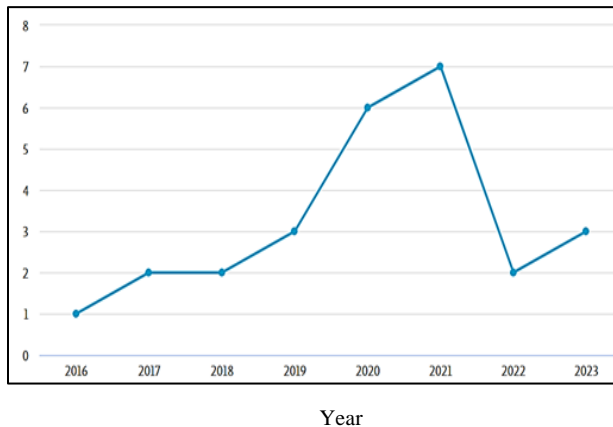


Fig.4 Supply chain and operational performance research growth (2015- 2023)

Based on the data presented in Figure 4, the investigation focuses on examining the correlation between Supply Chain Integration (SCI), Information Technology (IT), and the operational performance of nanostores. The study findings indicate that this research's focus was limited throughout the period from 2015 to 2019. However, there has been a notable rise in research activity between 2019 and 2021. Subsequently, the amount of research engagement experienced a decline in 2022. In 2023, though, more researchers started to investigate this area again.

#### B. Countries' Co-Authorship

Country wise, the analysis revealed that research on the operational performance of nanostores in the fields of SCI and IT was conducted in a total of 12 different countries. China made the most significant academic contribution, with a total of 21 studies and 1049 citations. The United States follows closely behind, with 12 studies and 1016 citations. Fig. 5 and Table II show the respective contributions made by each of the twelve countries.

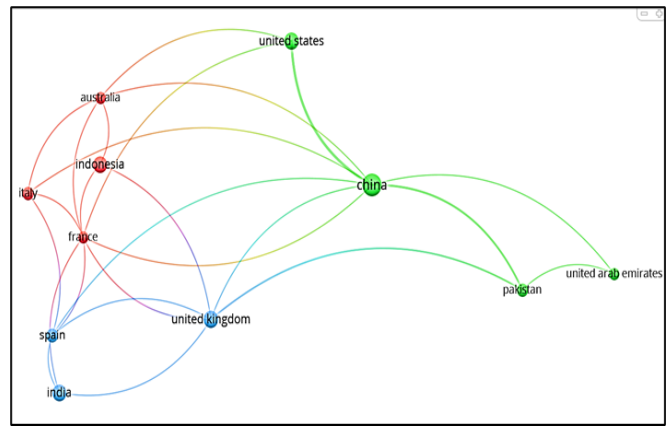


Fig.5 Countries Co-Authorship -VOS viewer analysis results.

TABLE II  
COUNTRIES CO-AUTHORSHIP ANALYSIS RESULTS

Country	No. of Studies	No. of Citations
China	27	1337
United States	11	454
France	7	365
Spain	10	578
United Kingdom	10	671
Italy	4	321
Pakistan	6	161
Australia	5	128
Portugal	4	119
India	4	163
Indonesia	5	29
United Arab Emirates	12	77

The analysis of country co-authorship also reveals an absence of research examining nanostores in developing countries and the Middle East. The only contribution among these countries was seen from the United Arab Emirates, which accounted for a total of 6 studies only.

#### V. CONCLUSION

This study provides insights into the relationships between the integration of the supply chain strategies and IT adoption, demonstrating the collaborative impact of these elements on the overall performance of nanostores. A thorough review of scholarly literature points to the development of an organized and flexible supply chain is crucial for nanostores to effectively fulfill customer demands in a timely manner, while also reducing operating expenses. Internal and external integration of supply chain play critical roles in the performance of organizations. Internal integration ensures that the functions of an organization act as part of a coordinated whole, whereas external integration emphasizes the importance of implementing practices jointly with suppliers, as well as customers to build relationships that help achieve a seamless flow of goods and materials in the supply chain. On the other hand, the integration of advanced information technology (IT) solutions, such as inventory management systems and point-of-sale platforms, has become

an essential tool in the process of facilitating operations, managing inventory levels, and ensuring precise demand forecasts.

Considering the significance of the topic matter, the present study employed VOSviewer analysis to evaluate the research focus related to the correlation between supply chain integration (SCI) and information technology (IT) to the operational performance of nanostores. The findings of this study revealed a notable dearth of scholarly investigations associated with these two important influencing factors of nanostores performance. The current study also highlights the need to establish framework for future scholarly investigations and processes of decision-making in the field of nanostore operations and emphasizes the need to employ an integrated strategy to achieve optimum operational performance, particularly in developing and the Middle East.

This article has made significant contributions to both the practical implementation of small retail management strategies and the theoretical and methodological understanding of this area. Moreover, it provides insights into the economic and social ramifications, which hold critical significance in today's business environment.

#### A. Implications of The Research

**Managerial Implication:** This study provides valuable insights into the potential optimization of operational performance for nanostores through the integration of IT solutions, such as inventory management systems or point-of-sale software. This information can help store managers make informed decisions to improve efficiency. This information can assist managers of stores in making well-informed choices aimed at enhancing operational efficiency.

Furthermore, the enhancement of supply chain efficiency in nanostores, including vendor relationships and inventory management, may offer practical recommendations for store managers seeking to minimize expenses and improve customer satisfaction.

Additionally, the research offers a theoretical structure for performing cost-benefit evaluations of information technology investments, aiding managers in evaluating the economic viability of adopting innovative technologies.

The research can identify barriers and facilitators of IT adoption in nanostores, helping managers understand the challenges and benefits of implementing digital solutions.

**Theoretical and Methodological Implication:** Developing or applying existing theoretical frameworks to understand the relationship between IT, supply chain, and operational performance in nanostores can contribute to the theoretical understanding of this area. In terms of methodological implications, the study introduces a new method for studying nanostores, and shedding the light on the lack of studies covering this area. It also has an opportunity to add to the growing body of operational performance benchmarks for nanostores, which can be used for analysis, comparison, and regulation. Both researchers and practitioners can benefit from the insights learned about nanostore IT adoption and supply chain management.

**Social Implications:** The societal implications of this research lie in the fact that it has drawn attention to the need to investigate more into how nanostores may benefit from the interaction of SCI and IT, namely in locations such as the Middle East and other developing countries.

#### B. Limitations of The Research

Despite the importance of these findings, it is essential to acknowledge the limitations of this study. For example, the study employed one database (i.e., Scopus), to identify relevant studies related to the subject matter, which may have a direct impact on the research outcomes and raises the likelihood of overlooking important data in alternative databases. However, the sample size used in this study for conducting a VOSviewer analysis was deemed sufficient. This highlights the need for more investigation and further research efforts to address these limitations in future studies.

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