Original Article

Revolutionizing Product Return Management: Harnessing Supply Community Network for Enhanced Customer Experience

Mohamed Omar Abdullahi[1*], Abdukadir Dahir Jimale[1], Yahye Abukar Ahmed[1], Abdulaziz Yasin Nageye[1]

[1]*Faculty of Computing, SIMAD University, Mogadishu, Somalia.*

[*]*Corresponding Author : momar@simad.edu.so*

Abstract - Ensuring a seamless and customer-friendly return process drives customer satisfaction and influences repeat purchases. This study explores the impact of proactive communications and a flexible return process with transparent options to create an exceptional returns experience. Leveraging the Supply Community Network (SCN) approach, enriched with social Internet of Things capabilities and humanoid social networking behavior assumptions, we propose a more effective and efficient application of product return processes. Our research extends the applicability of the SCN approach to encompass a product return scenario, thereby mirroring real-world interactions and distinct SCN configurations. Through a case study, we assess the approach's effectiveness and highlight key endeavors for its future use and refinement. Furthermore, we emphasize how the SCN approach effectively mitigates product return challenges by presenting a detailed application scenario. This approach demonstrates its potential to revolutionize product return management, paving the way for enhanced customer experiences and fostering lasting customer loyalty.

Keywords - Product return, Customer experience, Internet of Things, Social Internet of Things, Supply Community Network.

1. Introduction

Goods bought by customers are returned in swelling and worrisome levels as many customers switch to online from physical stores [1]. In 2018, retail merchandise returned to the United States and accounted for 369 billion U.S. dollars. According to Kevin J. Ryan (2019), merchandise worth $74 Billion gets returned around the holidays. 54% (more than half) of surveyed customers in research by WBR Insights said at least one gift had been returned from their purchases during holidays [2]. Many customers look at the online business's return policy before committing to a purchase and frequently choose to shop elsewhere if the online business does not provide a free and easy return process.

Proactive communications and a flexible return process with transparent options can incorporate an extraordinary returns experience. So, developing a free and easy product return process will be key to customer satisfaction and loyalty. Customers also prefer options concerning how they can return the merchandise obtained. Supply Chain Management (SCM) is being fueled by new communication technologies sponsored by massive cooperative efforts that facilitate absolute process integration. A new setting of social relationships between supply chain agents in a Supply Community Network (SCN) that accounted for possible interactions in the physical world were proposed in the previous studies of this work. A notion of agents assuming humanoid social networking behaviors, together with the Social Internet of Things (SIoT) components necessary to realize that aspiration. The SCN conceptualized the Supply Chains (SCs) as a network of Supply Community Agents (SCAs) connected throughout their transference of commodities/services, information, and remittances.

However, The SCN is only applied and tested for the order fulfillment process in terms of SC operations. Therefore, in this study, we extend the applicability of the SCN approach to the product return process in creating a better customer experience and ensuring the robust operations of SCN in product return process management. We also conceptualize the SCN approach with the product return process management using real-world scenarios and contextualize the work.

The structure of the remaining sections will be as follows. Section 2 will review the related work; Section 3 describes the SCN approach and then applies it to the product return process using a real-world scenario and places the work into context; finally, Section 4 sets out some conclusions and future research agenda.

2. Related Work

Online businesses have become one of today's economy's most significant and dynamic sectors, with the main factors prompting more competition. The growth of internet access has derived the dynamic development of online business [6]; [7]. Also, the increasing number of portable devices and growing mobility increased such dynamics in which customers order goods and services anytime, anywhere, more frequently. Customers not only order things but, more frequently, have access to everyday products rapidly. However, if product items do not meet the customer's desire, they need to return such products, and the return of online businesses should be seamless and leave a good experience. Such experience could add more customer value if businesses take the product return more seriously. This can increase the competitive advantage through better customer satisfaction and loyalty [6].

In online businesses, there are various reasons for product return, including personal dissatisfaction, change of mind, wrong purchase, or product quality. For the sized products or clothing, it might be a lack of correct fit or sometimes a product recall from the manufacturer. This return can be defined as *the process in which customers take the previously purchased product back to retailers so that they receive money back in exchange for an identical /different item*. So, the customer has the right to withdraw from the contract and return the ordered product. This is the most common type of product return in e-commerce and has been the focus of this study as the product return rate increases.

Consequently, firms are enhancing the effectiveness of material movement to decrease expenses. Simultaneously, the growth of E-commerce has also played a role in expanding the logistics sector and advancing logistics-related technology. [8]. An interactive perspective on SCs has changed the viewpoints of individual organizations to being part of bidirectional SCs. Both forward and reverse SCs (bidirectional) have similar competence and need similar resource requirements but differ in operational subprocesses [9]. Companies coordinate with suppliers, wholesalers, retailers, and consumers to achieve competitive advantages in their respective markets [10].

Mahadevan & Campus found that much research has been done on forward logistics activities that provide information flow and management decision-making that enable efficiency [11]. However, the author mentioned a limited discussion in reverse logistics operations. Mahadevan also found that "*there is a lack of robust information systems to manage processes; mentioning this lack of information systems translates to an apparent lack of SC visibility and information sharing along the reverse SC*" [12]. Several researchers attempted to conceptualize the reverse SC frameworks to manage product return in collaborative SCs. Dos Santos and Marins proposed an integrated model for reverse logistics to handle product returns effectively. However, their framework did not integrate various supply chain aspects, such as software for enterprise resource planning and warehouse management systems for managing returns. [13]. Likewise, Mahadevan [11] mentioned that [14] and [15] developed frameworks to address reverse logistics aspects. In addition, numerous conceptual frameworks have been offered previously in several studies, most identifying the network optimization [16] and the management processes involved [17].

[18] Introduced a strategic Decision Support System (DSS) framework merging strategic management and Strategic Information Systems Planning (SISP) to enhance decision-making effectiveness in logistics. Similarly, [19] scrutinized the benefits and trade-offs inherent in logistics decision-making, underscoring the necessity of knowledge and resource access for optimizing outcomes. [20] delves into reverse logistics, spotlighting activities, decision variables, and performance indicators to give managers improved decision-making tools. [21] proposes an Environmental Management Information System (EMIS) to refine reverse logistics decisions, addressing data quality and transferability concerns in prevalent decision-support models.

The enhancement of logistics activities for superior information flow and management decision-making hinges on accurately identifying information requirements and effective logistics information administration [22]. Implementing a logistics management system encompassing information inquiry terminals, data transmission heads, and host boxes is touted to ameliorate logistics management [23]. Likewise, a logistics information management system integrating modules for information storage, analysis, and vehicle-mounted operations stands to heighten transportation and warehouse management efficiency [18]. The amalgamation of strategic management processes, decision support systems, and strategic information systems planning is posited to yield efficacious decision-making in logistics.

Furthermore, the industry could embrace data-driven decision-making (DDDM) models informed by extant frameworks, data analytics principles, and the Cynefin framework. This model is delineated into setup, execution, and learning phases, supporting logistics companies' decision-making processes [3]. The statistical analysis of customer records could bolster logistics systems management by unveiling insights into customer behaviors, preferences, and typologies, facilitating informed decisions, enhanced efficiency, and cost reduction [4]. Furthermore, the adoption of Industry 4.0 technologies, encompassing ICT and digitization, presents an avenue for augmenting logistics management and decision-making, ultimately enhancing overall performance [5]. However, [3] proposed an SCN as a new setting of social relationships between agents of the SCs assumed humanoid social networking behaviors, together with the capability of the Social Internet of Things (SIoT).
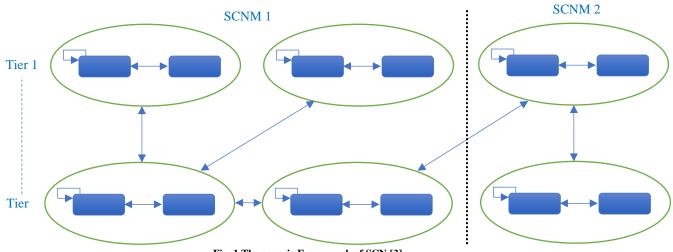
Fig. 1 The generic Framework of SCN [3]

This realized the aspiration of SCN, conceptualizing SCs as a network of Supply Community Agents (SCAs) that are bidirectionally connected throughout their transference of commodities/services, information, and remittances.

According to [5], the SIoT capabilities facilitated the flexibility of SCAs in the SCN and worked effectively to deliver the possibilities to discover, select, and utilize appropriate services throughout the SCN. It also yields a practical implication for applying SCN agility in market dynamics.

Therefore, we believe this idea can provide a seamless integration in the product return process to meet the customer's desire and leave with a good experience. Such experience adds more customer value and increases the competitive advantage through better customer satisfaction and loyalty.

3. The SCN Approach

The SCN approach, as outlined in the work by [3], pertains to the dynamic transformation of supply chains, which are progressively shifting from conventional linear architectures to more complex mesh-like formations. The strategy entails the utilization of intelligent and self-governing entities known as Supply Community Agents (SCAs) to substitute humanoid SCN "members" employed by member organizations.

These self-configuring entities independently form social connections with each other according to suitable laws (rules). The authors [3] suggested utilizing a pre-existing Social Internet of Things (SIoT) infrastructure to implement the concept of SCN. The generic object design of SCAs is expanded by defining interfaces for different member functions that all agents must have to share information about goods/services and payments.

The functionalities are delineated and specified based on their input parameters and output values. Service composition facilitates the exchange of goods/services, information, and payments between Agents.

SCN refers to the coordination and interactions among entities involved in the two-way movement of commodities, services, information, and finances within a loosely connected community. (All SCAs exhibit synergistic behavior, favoring strong ties while accommodating self-serving actions for survival. This balanced approach enhances resilience and competitiveness in dynamic markets.)

SCN, powered by SIoT, facilitates the smooth integration and independent coordination of SCAs to enhance operational efficiency. SCN perceives Supply Chains (SCs) as complex networks of Supply Chain Actors (SCAs), facilitating new relationships and sharing information. Supply chain aggregators (SCAs), like manufacturers, comprise various departments that work together to achieve optimal efficiency.

The ties between suppliers, customers, and SCAs are flexible and easily switched or replaced. Specialized SCNs enable bidirectional communication, facilitating direct supply by specific requirements. The autonomy of SCN guarantees the ability to be flexible and adaptable, hence fostering active participation within the network.

4. Product Return Process (Scenario)

Considering the SCN approach, we designed a real-world product return process scenario that applied to the SCN approach to make it easy for customers to return unsatisfied products.

Initiating the return: Customers can initiate the return process by logging into their account and selecting the item they want to return from their order history. They are then asked to

provide a reason for the return and are given the option to receive a refund or a replacement.

Creating a return label: Once the return is initiated, the organization creates a return label for the customer to print out and attach to the package. The label includes the customer's address, the organization's return address, and a unique tracking number.

Packaging the item: The customer then securely packages the item, including all original parts and accessories. The return label is attached to the outside of the package.

Shipping the item: The customer can then drop off the package at any authorized carrier location, such as a post office or shipping store. They can also schedule a pickup from their home or office. The package is then shipped back to the organization using the unique tracking number on the return label.

Processing the return: Once the Organization receives the item, it is inspected to ensure that it is in the same condition as when it was shipped to the customer. If the item is in acceptable condition, the customer's refund or replacement is processed. If the item is not in acceptable condition, the customer is contacted to discuss their options.

Such a system (SCN) of interconnected nodes enables organizations to collaborate on moving goods and information across the supply chain. It can enhance the visibility and control of the supply chain by providing real-time data on inventory, shipments, and customer behavior.

Therefore, here is how the organization's product return process could be enhanced using the SCN.

Initiating the return: Customers initiate the return process by logging into their organization account connected to the SCN. The SCN collects customer behavior data, such as their purchase history and reason for the return.

Creating a return label: Once the return is initiated, the SCN generates a unique tracking number for the return label, which is connected to the IoT devices used in the packaging and shipping process.

Packaging the item: IoT devices monitor the packaging process and track the package's weight, size, and contents. This data is used to optimize the shipping process and minimize costs.

Shipping the item: IoT devices also monitor the shipping process by tracking the package's location and condition in real-time. This data optimizes the delivery process and provides customers with accurate tracking information.

Processing the return: Once the Organization receives the item, it is scanned using IoT devices to ensure that it is in the same condition as when it was shipped to the customer.

If the item is in acceptable condition, the SCN is updated to process the customer's refund or replacement. If the item is not in acceptable condition, the customer is contacted to discuss their options. Figure 2 below shows the proposed SCN product return approach.
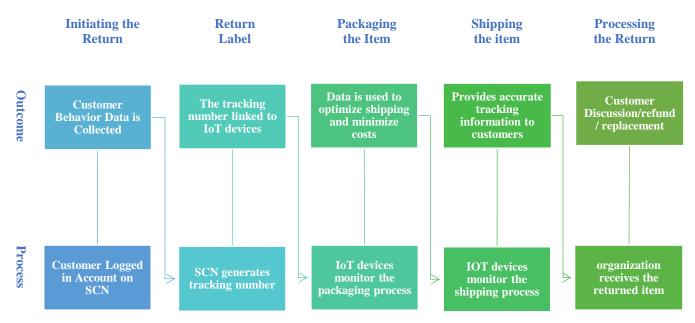

Fig. 2 The proposed approach

5. Conclusion

The SCN approach offers a transformative perspective on supply chain management, introducing a paradigm shift from traditional linear supply chains to interconnected, autonomous entities known as SCAs. This research has examined the potential outcomes of implementing the Supply Chain Network (SCN) method in online firms' product return procedures. By incorporating the principles of Supply Chain Network (SCN) with the complexities of the product return process, firms can significantly improve customer experiences, optimize operations, and obtain a competitive advantage in the ever-changing e-commerce landscape.

The escalating trend of online shopping has magnified the significance of seamless product returns, contributing to customer satisfaction and loyalty.Addressing the challenges associated with product returns through an SCN lens has several noteworthy implications. First and foremost, the SCN's focus on autonomous SCAs and the utilization of Social Internet of Things (SIoT) capabilities can revolutionize the entire return process. Initiating returns, generating return labels, packaging, shipping, and processing returns can all be augmented with real-time data collection and analysis through IoT devices. This infusion of intelligence accelerates the process and enables organizations to optimize shipping routes, minimize costs, and ensure product integrity.

Moreover, the SCN's emphasis on bidirectional communication and collaboration among SCAs can elevate customer experiences. Customer behavior data collected by the SCN can provide valuable insights into purchasing patterns, return reasons, and overall preferences. This information equips organizations to tailor their products, services, and return processes to align seamlessly with customer needs. The SCN framework facilitates transparent communication, proactive problem-solving, and personalized solutions, fostering enhanced customer satisfaction and loyalty. Furthermore, extending SCN principles to the product return process emphasizes the necessity of a holistic approach to supply chain management. To maintain seamless operations and data flow, several tools, such as enterprise resource planning and warehouse management systems, must be integrated. This underscores the importance of collaboration among supply chain stakeholders, including suppliers, manufacturers, retailers, and consumers, to create a more robust and efficient product return ecosystem.This study has illustrated that the SCN approach holds immense potential for revolutionizing the product return process in online businesses. By harnessing the capabilities of SCAs and SIoT, organizations can deliver unparalleled customer experiences, streamline operations, and achieve competitive advantages. As the e-commerce landscape continues to evolve, integrating SCN principles into product return processes emerges as a strategic imperative for organizations seeking to thrive in the digital marketplace. This paradigm shift in supply chain management meets the demands of modern consumers and sets the stage for a new era of customer-centricity, efficiency, and sustainable growth.

This study makes a substantial contribution to the current body of knowledge on supply chain management, customer experience, and e-commerce by introducing and implementing the SCN strategy for managing product returns. The primary contributions of this work can be succinctly described as follows:

- Innovative Application of SCN Approach: The study extends the conventional scope of the SCN approach by proposing its application to the product return process, a critical aspect of modern e-commerce. This innovative application opens new avenues for understanding how SCAs and IoT can revolutionize return processes, improving customer experiences and operational efficiency.
- Enhanced Customer-Centric Approach: The study prioritizes customer satisfaction and loyalty by integrating the SCN approach into the product return process. The scenario presented demonstrates how real-time data collection and analysis through IoT devices can lead to personalized solutions and transparent communication, enhancing the overall customer experience.
- Adaptation to Market Dynamics: The study addresses the challenges posed by the dynamic nature of the e-commerce landscape. By aligning the SCN approach with the product return process, organizations can become more agile in responding to changing market dynamics and customer preferences.
- Operational Efficiency and Cost Savings: Integrating IoT devices and SCAs in the product return process can optimize logistics, minimize costs, and reduce inefficiencies. This contribution is particularly relevant in an era where businesses strive for increased operational efficiency and cost savings.

While the study offers valuable insights and contributions, certain limitations and challenges should be acknowledged:

- Implementation Challenges: The successful implementation of the proposed SCN approach may require significant technological investments, integration of existing systems, and changes in organizational processes. Overcoming these challenges might not be straightforward and could vary based on the organization's size and structure.
- Data Privacy and Security: The use of IoT devices for data collection raises concerns about data privacy and security. Organizations must ensure that customer data is handled responsibly and complies with relevant regulations.
- Customer Adoption: The success of the SCN approach relies on customers' willingness to engage with the

technology and processes it entails. Some customers may be resistant to sharing certain data or may be concerned about the increased automation level.

- Generalizability: While the proposed scenario showcases the potential benefits of the SCN approach, its applicability to various products, industries, and organizational contexts may vary. A more comprehensive understanding of its generalizability is needed.

Therefore, this study's contributions lie in its innovative application of the SCN approach to product return management, its emphasis on customer-centricity, and its potential to enhance operational efficiency. However, the study also acknowledges potential challenges such as implementation, data privacy, and customer adoption, which must be carefully addressed to realize this approach's benefits fully.

References

[1] Marcia Kaplan, The Growing Problem of Customer Returns, PracticalEcommerce, 2019. [Online]. Available: https://www.practicalecommerce.com/the-growing-problem-of-customer-returns

[2] Kevin J. Ryan, $74 Billion Worth of Merchandise Gets Returned Around the Holidays, This Startup is Helping Retailers Deal with it Santa Monica-Based Happy Returns is Changing the Way Both Online and Brick-and-Mortar Shops Handle Returns, Inc.com, [Online]. Available: https://www.inc.com/kevin-j-ryan/happy-returns-retail-season.html

[3] Faith Moyo, Brenda Scholtz, and Mohammed Alhassan, "A Data-Driven Decision-Making Model for the Third-Party Logistics (3PL) Industry," *Kalpa Publications in Computing*, vol. 12, pp. 213-226, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[4] Enhou Zu et al., "Management Problems of Modern Logistics Information System Based on Data Mining," *Artificial Intelligence and Edge Computing in Mobile Information Systems*, vol. 2021, pp. 1-9, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[5] Gabriel Koman et al., "Benefits of Industry 4.0 for Logistics and Decision-Making of Managers," *LOGI-Scientific Journal on Transport and Logistics*, vol. 10, no. 2, pp. 33-41, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[6] Arkadiusz Kawa, and Magdalena Wałęsiak, "Marketplace as a Key Actor in E-Commerce Value Networks," *LogForum*, vol. 15, no. 4, pp. 521-529, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[7] Wojciech Piotrowicz, and Richard Cuthbertson, "Introduction to the Special Issue Information Technology in Retail: Toward Omnichannel Retailing," *International Journal of Electronic Commerce*, vol. 18, no. 4, pp. 5-16, 2014. [CrossRef] [Google Scholar] [Publisher Link]

[8] Mariem Masmoudi, Mounir Benaissa, and Habib Chabchoub, "Optimisation of E-Commerce Logistics Distribution System: Problem Modelling and Exact Resolution," *International Journal of Business Performance and Supply Chain Modelling*, vol. 6, no. 3, pp. 358-375, 2014. [CrossRef] [Google Scholar] [Publisher Link]

[9] Glenn C. Parry et al., "Operationalising IoT for Reverse Supply: The Development of Use-Visibility Measures," *Supply Chain Management: An International Journal*, vol. 21, no. 2, pp. 228-244, 2016. [CrossRef] [Google Scholar] [Publisher Link]

[10] Martha C. Cooper, Douglas M. Lambert, and Janus D. Pagh, "Supply Chain Management: More Than a New Name for Logistics," *The International Journal of Logistics Management*, vol. 8, no. 1, pp. 1-14, 1997. [CrossRef] [Google Scholar] [Publisher Link]

[11] Kumaraguru Mahadevan, "Reverse Logistics: From Chitty, Chitty, Bang, Bang to Fast and the Furious," *ANZAM 2019 Conference-Wicked Solutions to Wicked Problems: The Challenges Facing Management Research and Practice*, Cairns, Queensland, Australia, pp. 396-416, 2019. [Google Scholar]

[12] Kumaraguru Mahadevan, "*Investigation of Collaborative Supply Chain Practices through Integration, Visibility and Information Sharing: Theoretical and Industry Perspective*," Western Sydney University, pp. 1-521, 2013. [Google Scholar] [Publisher Link]

[13] Reinaldo Fagundes dos Santos, and Fernando Augusto Silva Marins, "Integrated Model for Reverse Logistics Management of Electronic Products and Components," *Procedia Computer Science*, vol. 55, pp. 575-585, 2015. [CrossRef] [Google Scholar] [Publisher Link]

[14] Mohammed Shaik, and Walid Abdul-Kader, "Performance Measurement of Reverse Logistics Enterprise: A Comprehensive and Integrated Approach," *Measuring Business Excellence*, vol. 16, no. 2, pp. 23-34, 2012. [CrossRef] [Google Scholar] [Publisher Link]

[15] Amir M. Sharif et al., "Evaluating Reverse Third-Party Logistics Operations Using a Semi-Fuzzy Approach," *International Journal of Production Research*, vol. 50, no. 9, pp. 2515-2532, 2012. [CrossRef] [Google Scholar] [Publisher Link]

[16] Sibel A. Alumur et al., "Multi-Period Reverse Logistics Network Design," *European Journal of Operational Research*, vol. 220, no. 1, pp. 67-78, 2012. [CrossRef] [Google Scholar] [Publisher Link]

[17] A. Niknejad, and D. Petrovic, "Optimisation of Integrated Reverse Logistics Networks with Different Product Recovery Routes," *European Journal of Operational Research*, vol. 238, no. 1, pp. 143-154, 2014. [CrossRef] [Google Scholar] [Publisher Link]

[18] Fotis Kitsios, and Maria Kamariotou, "Decision Support Systems for Strategic Information Systems Planning: An Approach for Logistics Strategic Management," *International Journal of Decision Support Systems*, vol. 3, no. 3-4, pp. 207-221, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[19] Lucineide Bispo dos Reis Luz, and Claudio Parisi, "Trade-Off in the Decision-Making Process: Research with Logistics Area," *Brazilian Strategy Magazine*, vol. 11, no. 3, pp. 387-403, 2018. [Google Scholar] [Publisher Link]

[20] Kuldip Singh Sangwan, "Key Activities, Decision Variables and Performance Indicators of Reverse Logistics," *Procedia CIRP*, vol. 61, pp. 257-262, 2017. [CrossRef] [Google Scholar] [Publisher Link]

[21] Dennis Stindt, "An Environmental Management Information System for Improving Reverse Logistics Decision-Making," *International Conference on Computational Logistics*, pp. 163-177, 2014. [CrossRef] [Google Scholar] [Publisher Link]

[22] Marta Kadłubek, "Information Areas in Logistics Supply Chain Management," *Organizations and Performance in a Complex World: 26th International Economic Conference of Sibiu (IECS)*, pp. 79-920, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[23] Dmitriy Muzylyov, Natalya Shramenko, and Vitalii Ivanov, "Management Decision-Making for Logistics Systems Using a Fuzzy-Neural Simulation," *Advances in Industrial Internet of Things*, *Engineering and Management*, pp. 175-192, 2021. [CrossRef] [Google Scholar] [Publisher Link]