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INFLUENCE OF SUPPLY CHAIN COLLABORATION ON ENVIRONMENTAL SUSTAINABILITY AND IMPLICATIONS FOR PUBLIC HEALTH: A SYSTEMATIC LITERATURE REVIEW[1]

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ВПЛИВ СПІВПРАЦІ В ЛАНЦЮГУ ПОСТАЧАННЯ НА ЕКОЛОГІЧНУ СТІЙКІСТЬ З НАСЛІДКАМИ ДЛЯ СФЕРИ ГРОМАДСЬКОГО ЗДОРОВ'Я: ОГЛЯД НАУКОВИХ ДЖЕРЕЛ

Utilizing a systematic literature review approach, the study delves into the intricate relationship between supply chain collaboration and environmental sustainability. Supply chains, as complex networks of interconnected organizations, often face significant challenges that hinder their efficiency and sustainability. Among these challenges are communication distortions that result in bullwhip effects, inefficiencies in logistics and inventory management, vulnerabilities in supply networks due to unexpected disruptions, and difficulties in tracking and managing product flow due to the increasing complexity of modern supply chains. Furthermore, the lack of a unified approach and inconsistent operational models that do not prioritize collaboration and integration exacerbate these challenges. Recognizing these challenges, modern supply chains are increasingly adopting integrated and comprehensive strategies to enhance their environmental performance. By fostering stronger collaboration, firms can ensure better resource utilization, minimize waste, and create sustainable operational models that align with global ecological goals. The study emphasizes the

importance of teamwork in achieving sustainability but extends beyond theoretical discussions by focusing on empirical investigations. It seeks to explore the practical implications of supply chain collaboration, addressing the real-world challenges that firms face and how they can overcome these barriers to enhance sustainability performance. The study uses secondary data from 2000 to 2024 to examine how information sharing, cooperative planning, and incentive alignment contribute to more effective and sustainable supply chain practices. Research findings highlight the transformative role of digital communication platforms, advanced data analytics, and emerging technologies in improving transparency, efficiency, and cooperation among supply chain participants and making an impact in the public health domain. The study provides valuable insights for practitioners and scholars, offering a roadmap for organizations seeking to build resilient and sustainable supply chains. Literature review revealed that according to the opinion of scholars, a well-integrated and collaborative supply chain can catalyze achieving long-term environmental sustainability, ensuring that businesses operate efficiently while minimizing their ecological impact.

Дослідження зосереджено на аналізі впливу співпраці в ланцюзі постачання на екологічну стійкість, що здійснено за допомогою огляду літературних джерел. Як правило, ланцюги постачання стикаються з проблемами, такими як спотворення комунікацій, що призводить до ефекту "хлистка", вразливість постачальних мереж, проблеми в управлінні продуктами через складність ланцюгів постачання, а також змінні моделі, які не є інтегративними і не підтримують співпрацю. Крім того, існують проблеми, пов'язані з невідповідністю цілей і недовірою між учасниками ланцюга постачання. Зважаючи на це, сучасні ланцюги постачання використовують інтегровані та комплексні підходи, що стають дедалі важливішими для досягнення високих результатів у сфері екологічної стійкості. Дослідження підкреслює переваги командної роботи для сталого розвитку, однак основний акцент робиться на емпіричних дослідженнях, що

зосереджуються на проблемах у цій тематиці та їх практичному застосуванні, зокрема в сфері забезпечення громадського здоров'я. Авторами досліджені вторинні дані за період з 2000 по 2024 роки, що демонструють, як обмін інформацією, спільне планування та узгоджені стимули можуть покращити співпрацю в ланцюзі постачання через ефективне використання ресурсів, упровадження принципів лінійного виробництва та забезпечення екологічної ефективності. Результати дослідження показали, що цифрові комунікаційні платформи та аналітика даних є потужними інструментами для забезпечення прозорості та співпраці між учасниками ланцюга постачання. Дослідження також вказує на важливість використання новітніх технологій для покращення комунікації та зниження витрат у ланцюгах постачання. Упровадження інноваційних методів планування та моніторингу дозволяє компаніям значно зменшити негативний вплив на навколишнє середовище, що є важливим кроком для досягнення сталого розвитку. Тому ланцюги постачання відіграють значну роль у створенні сталого майбутнього, використовуючи технологічні досягнення та просуваючи спільні екологічні цілі. Це, в свою чергу, допомагає покращити екологічну ефективність через співпрацю, надаючи цінну інформацію для практиків та дослідників.

Keywords: *supply chain management, environmental performance, sustainability concept, health issues, bibliometric analysis.*

Ключові слова: *управління ланцюгом поставок, екологічна ефективність, концепція сталого розвитку, проблеми охорони здоров'я, бібліометричний аналіз.*

Problem statement. According to Mentzer et al. 2001 [1] the conventional supply chains had little inter-participant contact and information sharing operated in silos. Contrary to that, in their study, Lee et al., 2004 [2] referred to the bull-whip effect as the term used to describe how this emphasis on individual

optimization frequently resulted in inefficiencies throughout the entire chain. This ordeal resulted in the pregnancy of supply chain collaboration as the network of single unit [3]. Ahi and Erel [4] contended that one of the significances of supply chain collaboration on environmental sustainability is the recognition made by modern researchers and scholars. Research findings revealed that supply chain collaboration has gained substantial momentum in today's fiercely competitive and environmentally conscious commercial world. However, modern researchers like [5] are actively looking for strategies to improve supply chain collaboration and environmental sustainability performance, considering the rising levels of social and economic activities. In environmental sustainability, supply chain management (SCM) has emerged as a crucial component of international corporate operations. Coordinated efforts across all supply chain partners are essential for organizations to meet their sustainability targets in a world where environmental concerns are rising [3]. While considerable studies have explored SCM and environmental sustainability separately, the author of [4] believed that there is an important gap that exists in understanding how collaborative behaviors within supply chains specifically influence environmental performance. Existing literature lacks in-depth knowledge of how various supply chain collaboration models differentially impact environmental performance across different sectors and geographical regions [6]. Considering the reality surrounding this area of study, it is the researchers' idea to bridge the gap by investigating supply chain collaboration and its impact on environmental sustainability in greater detail. The penultimate goal is to close the knowledge gap and support the development of more potent plans for improving environmental sustainability performance through cooperative and integrative supply chains.

Literature review. According to [7], a collaborative supply chain is more than just a straightforward network of companies. In this dynamic ecosystem, linked businesses use coordinated planning, information exchange, and incentives that are in line with each other to build a value chain that is more effective and long-lasting. This cooperative method ensures that environmental factors are integrated

into all production, distribution, and consumption phases, fostering a holistic viewpoint [5].

A few essential pillars are necessary for successful teamwork. First and foremost, safe and prompt information exchange throughout the supply chain is essential [8]. Partners can identify "hotspots," or locations with the greatest environmental impact, thanks to this transparency. This mutual awareness enables cooperative actions to minimize environmental effect, such cutting down on energy use or waste production across the board [6].

Secondly, collaboration empowers partners to establish shared environmental goals beyond individual optimization [4]. This collaborative goal-setting can involve jointly developing principles for designing environmentally friendly products (eco-design), implementing sustainable sourcing practices throughout the supply chain, or working together on investments in renewable energy sources [9].

Lastly, incentives for sustainability must be aligned for a collaborative strategy to be successful [6]. This entails setting up incentive programs encouraging environmentally conscious behavior among all supply chain participants and performance measures monitoring the chain's advancement toward environmental targets. For example, cost-sharing arrangements might be implemented to encourage adopting sustainable practices, or partners can get rewards for working together to surpass environmental performance goals [1].

This article aims to bridge a gap by investigating supply chain collaboration's impact on environmental sustainability in greater detail. By incorporating earlier research, this article seeks to provide practitioners and academics in sustainable supply chain management with insightful information. The ultimate goal is to close the knowledge gap and support the development of more potent plans for improving environmental performance through cooperative supply chains.

Methods. Using a systematic literature review (SLR), the study investigates how supply chain collaboration affects environmental sustainability. The review's search technique used large-scale databases like Business Source Complete, ScienceDirect, Web of Science, Scopus, Emerald Insight, and JSTOR. Using

boolean operators, important search terms such as "collaboration and sustainability," "environmental sustainability," "green supply chain," "sustainable supply chain management," and "supply chain collaboration" were merged. Further sources were found using Google Scholar, reference lists, and the snowballing method.

Inclusion criteria required studies to be published between 2000 and 2024, be peer-reviewed, written in English, and address the impact of supply chain collaboration on environmental sustainability. The study had to use empirical data or theoretical frameworks and employ quantitative, qualitative, or mixed methods. Exclusion criteria filtered out editorials, commentaries, book reviews, unpublished works, non-English studies, and studies focused solely on economic or social aspects of collaboration. Additionally, studies with small sample sizes or weak methodologies, such as action research or single-case studies, were excluded.

The analysis used a narrative synthesis to interpret and summarize conceptual findings from various studies. A critical analysis and synthesis aimed to contribute new research by understanding the interaction between supply chain collaboration and environmental sustainability. This methodology has several limitations, including potential publication bias, language bias, and scope limitations due to the search strategy and time frame. Subjectivity in data extraction and interpretation and the limitations of individual studies included in the review could also affect the findings.

Notwithstanding these shortcomings, the methodology analyzes the relationship between supply chain collaboration

Results. Sustainability in the environment is more than just reducing damage to the environment (Table 1). It's an umbrella term that includes the ecosystems' capacity to sustain human progress and life sustainably and sustainably [10]. The concept acknowledges the complex relationships between ecological processes, natural resources, and human activities [5].

Collaborative supply chains offer a multitude of benefits for environmental sustainability. Information sharing across partners creates a shared view of the

environmental impact throughout the supply chain [8]. This transparency, or "collaborative visibility," empowers partners to optimize resource utilization, minimize waste generation, and identify opportunities for cleaner production processes across the entire network. Collaboration allows partners to move beyond individual environmental goals and establish shared objectives [4]. This collaborative approach can involve developing eco-design principles for products, implementing sustainable sourcing practices throughout the supply chain, or even working together on investments in renewable energy sources [9]. Such joint initiatives can lead to significant environmental improvements that may be difficult or impossible to achieve by individual companies acting alone. The collaborative approach stimulates sustainability by coordinating motivations across the supply chain [6].

Table 1. Main aspects of sustainability concept meaning

Key aspects	Meaning	Source
Keeping the Environmental Balance	Safeguarding the long-term practicality of ecosystems and natural resources is a fundamental principle. This entails reducing the effects of climatic change, protecting air and water quality, and protecting biodiversity.	[4]
Conservation and Efficiency of Resources	Environmentally friendly methods concentrate on reducing resource depletion and the production of waste. This may involve taking steps like embracing the concepts of the circular economy, rationalizing the use of water and energy across the supply chain, and putting in place ethical waste management techniques.	[11]
Equity Across Generations	The ultimate objective of environmental sustainability is to satisfy current requirements without endangering the capacity of future generations to satisfy their own. This proactive strategy aims to preserve a healthy planet for future generations while acknowledging the continuing effects of our activities.	[12]
Environmental and Social Responsibilities	Sustainability acknowledges the relationship between social and environmental experiments. Companies that practice sustainability take into account both their environmental impact and the social effects of their operations, such as ethical effort practices and responsible sourcing.	[13]

Source: Authors own construct

This entails developing performance measures to monitor the advancement of ecological goals and incentive systems that encourage ecologically conscious behavior. For example, shared expense arrangements might be implemented to encourage adopting sustainable practices, or partners can get rewards for working together to exceed environmental performance goals [1]. All supply chain participants have a stake in attaining environmental sustainability through aligned incentives. These "Core Pillars" are vital techniques and procedures that enable effective supply chain collaboration to achieve environmental sustainability (Table 2). They serve as a foundation for companies to build upon when collaborating to lessen their ecological impact. The impact of supply chain collaboration on environmental sustainability is examined in this study, which focuses on research published between 2000 and 2024. The significance of teamwork in accomplishing environmental objectives, maximizing resource use, reducing waste, and putting sustainable practices into effect are some of the key findings. Digital communication channels, data analytics tools, and information-sharing platforms are examples of technological innovations essential for improving collaboration and transparency among supply chain participants. Building trust and promoting the exchange of best practices and knowledge among all stakeholders necessitates active participation and open communication for collaboration to be effective. Reduced emissions, greater resource efficiency, and waste minimization are examples of how this might improve environmental performance metrics. Nonetheless, issues including poor communication, a lack of trust, cultural differences, and trouble coordinating strategic objectives continue to exist. There are environmental benefits to many forms of collaboration, such as supplier integration, cooperative product creation, and knowledge exchange. Certain advantages, such lower greenhouse gas emissions, better water management, and more use of recycled materials, have been shown in studies. Technology, transparency, and trust are the three main determinants of successful collaboration.

Table 2. Core pillars of collaborative approach

Core Pillars	Meaning	Date & Source
Partnership Formation	Partner selection is essential to the success of any collaborative network-building project. In an ideal world, partners would have complementary strengths, similar routines, and a shared goal of environmental sustainability. Successful collaboration requires formal agreements that define roles, duties, and the sharing of risks. Furthermore, dynamic partnering strategies, in which companies temporarily join forces for particular initiatives, provide flexibility in the establishment of a cooperative network	[14-16]
Information Sharing and Transparency	The basis of a productive partnership is safe and timely data sharing. Partners can obtain real-time information visibility throughout the supply chain using technology such as cloud platforms, blockchains, and sophisticated analytics tools. When all parties involved have equal access to information, transparency promotes trust and makes cooperative decision-making to lessen environmental effects possible	[8; 17-19]
Coordination and Integration	Effective collaboration among many entities throughout the supply chain necessitates aligning operations, processes, and systems. This could entail creating coordinated logistical operations to maximize resource use, integrating planning and forecasting tools for improved decision-making, and standardizing data formats to assure interoperability. Platforms for collaboration can serve as a focal point for information sharing, group planning, and performance tracking in real-time	[3; 4; 6]
Joint Risk Assessment	Supply chains are, by nature, vulnerable to disruptions that may hurt environmental performance. By exchanging information, collaborative partners can proactively identify potential hazards and create backup plans to mitigate their effects. This proactive strategy may entail building collaborative response protocols, planning scenarios for possible interruptions, and doing joint risk assessments to ensure a prompt and well-coordinated reaction.	[20; 21]
Measuring Performance and Continually Improving	Monitoring the advancement of collaborative environmental objectives is vital for guaranteeing continued achievement. Key performance indicators (KPIs) should be established by partners by their common environmental goals. Metrics like energy use, waste production, and carbon footprint reduction could be included in these KPIs. Partners can discover areas for improvement and launch new cooperative activities to constantly optimize environmental performance across the supply chain by conducting regular performance evaluations	[6; 22]

Source: Authors own construct

Despite the benefits, challenges like communication gaps, competition concerns, and limited understanding of sustainability practices remain. Trends in collaboration and its environmental impact vary by region and industry. The

review also highlights the critical role of resource efficiency in driving sustainability and fostering innovation through diverse perspectives and collective knowledge.

The literature review emphasizes the benefits of supply chain collaboration on environmental sustainability, but it also suggests more empirical studies to identify the precise contributions and address current issues. Further research should concentrate on the larger sample of articles initially analyzed but not deeply in this work.

Conclusion. The revolutionary potential of supply chain collaboration on environmental sustainability is shown by this comprehensive systematic literature review. Advances in information-sharing technology enable firms to improve resource use, decrease waste, and adopt sustainable practices through collaboration across the supply chain. Successful cooperation between stakeholders necessitates open communication and trust, leading to measurable improvements in environmental performance.

However, challenges such as communication gaps and misaligned goals persist. The research also highlights the critical role of resource efficiency, driven by collaboration, which benefits the environment and offers economic advantages. Significantly, the assessment notes that more investigation is required to examine the precise environmental contributions of various collaborative models and how to get around obstacles that stand in the way of productive collaboration.

Supply chains can be crucial in building a more sustainable future by encouraging a cooperative strategy that prioritizes common environmental goals and uses technology improvements. To sum up, this study provides insightful information to help businesses and policymakers manage this crucial shift.

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