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## Article

Developing sustainable business-to-business (B2B) strategies in service innovation for enhancing customer loyalty in the petrochemical industry: a systematic review

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# Developing sustainable business-to-business (B2B) strategies in service innovation for enhancing customer loyalty in the petrochemical industry: a systematic review

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## ABSTRACT

This research aims to provide a comprehensive understanding of the factors that drive successful sustainable service innovation and to offer practical guidelines for adopting these strategies in the petrochemical sector. The study employs a systematic literature review methodology, reviewing and synthesizing empirical data, theoretical frameworks, and case studies from peer-reviewed journals published between 1998 and 2024. A multi-database search strategy was utilized, incorporating keywords related to sustainability and service innovation. The selection process followed a PRISMA flow diagram to ensure the inclusion of relevant and high-quality sources. The results highlight several key factors driving sustainable service innovation, including stakeholder engagement, sustainability policies, growth frameworks, and specific determinants of service innovation such as organizational culture, leadership, and technology. This study provides valuable insights for managers and policymakers on promoting and implementing sustainable service innovation to achieve long-term sustainability goals. The comprehensive analysis presented in this research offers a roadmap for petrochemical companies to navigate the complexities of sustainability while maintaining customer loyalty and ensuring economic viability in a rapidly evolving market. This study contributes to the existing body of knowledge by detailing the determinants of sustainable service innovation and their practical application in the petrochemical industry.

## ARTICLE HISTORY

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## Introduction

Sustainability has increasingly become a critical issue across various sectors, including the petrochemical industry, which is notorious for its substantial environmental impact (Al-Sharrah et al., 2010; Ite et al., 2016; Yousef et al., 2024). This industry often faces criticism for its role in climate change, as well as air and water pollution, and environmental degradation (Al-Samhan et al., 2022). Consequently, there is mounting pressure on companies within this sector to implement more sustainable business practices (Ghaithan et al., 2021; Tilsted & Bauer, 2024). Sustainability extends beyond merely adhering to environmental regulations; it encompasses corporate social responsibility (CSR), which involves proactive efforts to lessen negative impacts on both the environment and society (Hadj, 2020). By adopting sustainable strategies, petrochemical companies can significantly contribute to the global sustainable development goals outlined in the United Nations' 2030 Agenda (J. Lu et al., 2021). Furthermore, sustainability in this industry entails the efficient use of natural resources, the reduction of greenhouse gas emissions, and the development of renewable energy within their energy portfolios (He et al., 2022). Companies that effectively incorporate sustainability principles into their operations are more likely to earn the trust of stakeholders, including customers, investors, and regulators (Almagtome et al., 2020; Kahupi et al., 2021; Stupak et al., 2021). This trust can, in turn, enhance

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customer loyalty (Glaveli, 2021), bolster the company's reputation (Gomez-Trujillo et al., 2020), and increase competitiveness in a global market that is increasingly conscious of environmental issues (Alam & Islam, 2021).

Maintaining customer loyalty within the petrochemical industry poses a significant challenge. Customers, whether individuals or corporations are becoming more conscious of the importance of sustainability and environmental responsibility (Chuah et al., 2020). They tend to prefer companies that not only deliver high-quality products and services but also demonstrate a commitment to sustainable practices (Tsvetkova et al., 2020). Thus, petrochemical companies must adapt to the evolving expectations and preferences of their customers. Moreover, the intense competition in this sector exacerbates the challenge of maintaining customer loyalty (Brömer et al., 2019; Kumar & Joshi, 2023). Numerous companies are striving to develop new technologies that are both more efficient and environmentally friendly (Porter & Van der Linde, 1995; Shrivastava, 2018). To remain relevant and competitive, companies must continually innovate their services, ensuring these innovations align with sustainability goals (Hermundsdottir & Aspelund, 2021; Ibarra-Cisneros et al., 2023; Velayati et al., 2020).

Addressing these challenges necessitates a focus on sustainable service innovation within the petrochemical industry. Sustainable service innovation involves the development and implementation of new services or the enhancement of existing ones in ways that promote environmental, social, and economic sustainability (Calabrese et al., 2021; Horng et al., 2018). This approach not only aids in meeting regulatory requirements and societal expectations but also drives business growth and competitiveness. By concentrating on sustainable service innovation, petrochemical companies can create value-added services that mitigate environmental impacts (Samuel et al., 2013), enhance resource efficiency (Shinkevich et al., 2019), and foster positive relationships with stakeholders (Fomukong, 2014). For example, integrating digital technologies in service operations can optimize operational efficiency and minimize waste (Javaid et al., 2022). These technologies enable real-time monitoring of processes, predictive maintenance, and energy management (Shrouf & Miragliotta, 2015), thereby reducing the overall environmental footprint (Marinakakis et al., 2020).

The core contribution of this study lies in its comprehensive mapping of existing research on sustainable service innovation through a Systematic Literature Review (SLR), which encompasses a broad range of publication years. By identifying the key determinants driving sustainable service innovation, this research offers a thorough understanding of the factors essential for successful implementation in the petrochemical industry. Furthermore, this study enriches the existing body of knowledge by providing detailed insights and practical guidelines for adopting sustainable service innovation strategies, ultimately enhancing customer loyalty in the industry.

Based on the description above, the research question (RQ) for this study is: 'What are the determinant variables of sustainable service innovation?'

## Materials and methods

### *Service innovation vs sustainable service innovation*

Service innovation refers to the development or introduction of new or enhanced services to meet customer needs and provide added value. According to Bitner et al. (2008), service innovation encompasses three main aspects: technology, service interaction, and service process. They state that 'service innovation encompasses the development of new services, improvements in service delivery, and enhancements in customer interactions' (Bitner et al., 2008). Service innovation can also involve changes in how services are delivered, which can lead to increased efficiency and customer satisfaction (Carlborg et al., 2014).

Furthermore, service innovation is crucial for maintaining competitive advantage in a rapidly changing market. Den Hertog et al. (2010) identified six dimensions of service innovation: new service concepts, new service interfaces, new service delivery systems, new service technologies, changes in logistics, and service strategic orientations. They state that 'service innovation is multidimensional, involving changes in service concepts, client interfaces, service delivery systems, technologies, logistics, and strategic orientations' (Den Hertog et al., 2010).

Meanwhile, sustainable service innovation refers to service innovations that not only focus on creating economic value but also consider social and environmental impacts. According to Kleindorfer et al. (2005), sustainable service innovation is 'the process of developing new services or improving existing ones in a way that they meet the needs of the present without compromising the ability of future generations to meet their own needs' (Kleindorfer et al., 2005). They emphasize the importance of considering the long-term impacts of service innovation on the environment and society. Moreover, sustainable service innovation also involves sustainable service innovation involves integrating sustainability principles into service design and delivery, which can enhance brand reputation, customer loyalty, and long-term profitability (Chen et al., 2010).

The importance of sustainable service innovation in the context of modern business has increased with growing awareness of environmental and social issues. Sustainable service innovation not only contributes to environmental sustainability but can also be a key driver in building a positive company image and enhancing customer satisfaction (Boons & Lüdeke-Freund, 2013).

### ***Systematic literature Review (SLR)***

The primary objective of this research was to advance the theoretical and practical understanding of sustainable service innovation within the petrochemical industry, rather than to make a novel methodological contribution. The methodology adopted, a Systematic Literature Review (SLR), was chosen due to its strength in synthesizing and analyzing a wide range of existing studies to provide a comprehensive overview of the key determinants in this area (Kitchenham, 2012). SLR is a method used to systematically identify, evaluate, and synthesize relevant literature on a specific topic (Pati & Lorusso, 2018). Unlike traditional literature reviews, SLR follows a more structured and transparent approach, ensuring inclusivity and the quality of studies reviewed (Feng et al., 2017; Van Dinter et al., 2021). This method involves several key steps, including defining clear research questions, setting inclusion and exclusion criteria, conducting an extensive literature search across multiple databases, and assessing the quality of the identified studies (Kitchenham, 2012; Moher et al., 2009; Tranfield et al., 2003). The process culminates in a synthesis of findings, which can be performed qualitatively or quantitatively, depending on the research objectives. SLR is highly valued for its ability to provide a comprehensive overview of a specific topic, enabling researchers to identify gaps in the literature and establish a robust foundation for future research (Booth et al., 2021; Snyder, 2019). Additionally, the systematic and well-documented nature of SLR makes it replicable and enhances the validity of findings, which is crucial in evidence-based research (Higgins et al., 2019; Petticrew & Roberts, 2008).

While other methods such as empirical surveys or case studies could have been considered, the SLR was deemed most appropriate for this study as it allows for a broad review of literature, ensuring that the findings are grounded in a robust analysis of existing research (Van Dinter et al., 2021). The SLR is a well-established methodological approach in academic research, particularly suitable for studies aimed at consolidating and summarizing knowledge rather than generating new empirical data (Snyder, 2019). Given that the SLR methodology is widely recognized and accepted, it does not require the same level of validation as novel or experimental methods (Feng et al., 2017). Instead, its validity stems from the rigorous process of systematically reviewing and synthesizing peer-reviewed literature, which provides a reliable foundation for the conclusions drawn in this study.

### ***Literature search strategy***

The literature search was systematically designed to investigate and gather various comprehensive sources discussing sustainable service innovation. This study uses the SLR approach suggested by Barbara Kitchenham (2014) and Moher et al. (2009). A multi-database search strategy was applied using several leading academic platforms, including Scopus, Web of Science, and Google Scholar. Searches were conducted using combinations of keywords and phrases related to sustainability such as 'sustainability' and 'sustainable', as well as service innovation such as 'service innovation'. Boolean operators like AND and OR were used to combine these keywords, for example, search phrases like 'sustainable service innovation', 'sustainable service improvement', and 'service innovation' AND 'sustainability'.

The literature search spanned from 1998 to 2024, with a specific focus on capturing the latest developments in research on sustainability in the context of service innovation. This method is expected to provide a comprehensive understanding of various approaches and findings in this relevant domain. To find out the flow of article selection in this research, a PRISMA flow diagram was created which is presented in Figure 1.

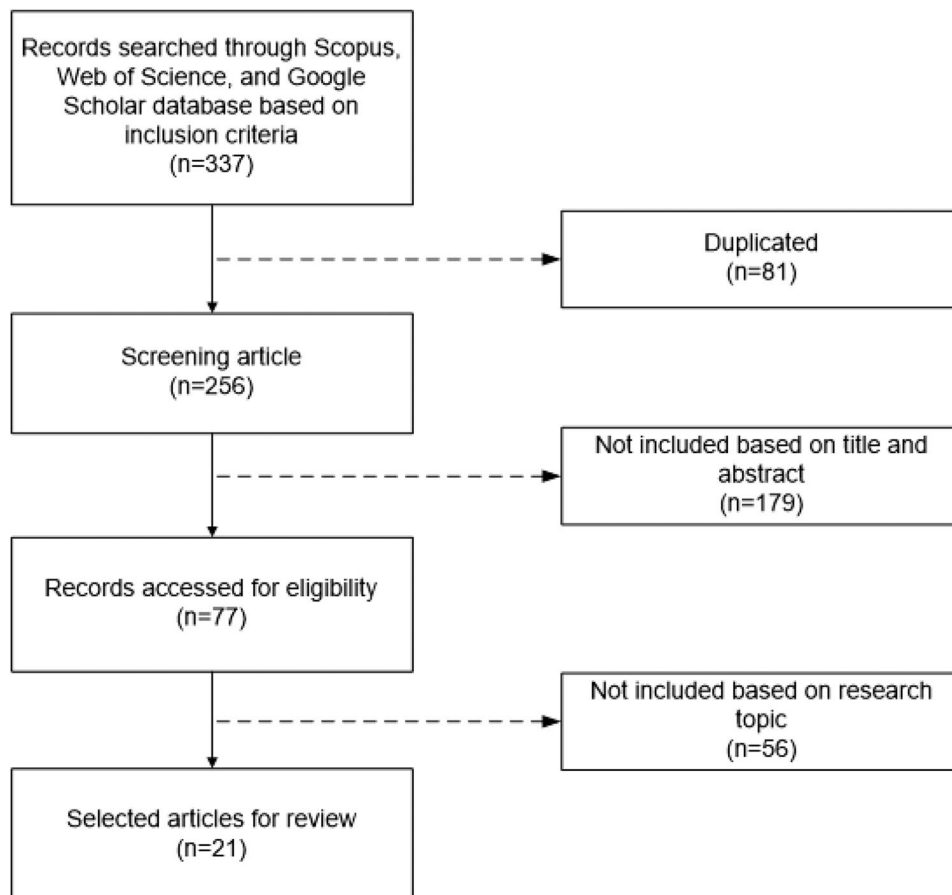
### ***Inclusion and exclusion criteria***

This study involved a manual article review process in three stages, including title, abstract, and full-text review (Kitchenham, 2012). Relevant sources were defined through specific inclusion and exclusion criteria to guarantee their relevance and quality.

Inclusion Criteria:

1. Studies published between the years 1998–2024.
2. Articles that are part of journals or in the proceedings (excluded are books, book chapters, reviews, or conference reviews).
3. Articles referring to sustainability and service innovation in the title, abstract, or full text.
4. Articles containing empirical data, theoretical frameworks, or illustrative case studies of methodologies, challenges, and/or results regarding sustainability and service innovation.
5. Full-text sources in English, as a global accessibility criterion.

Articles were included in this review if they met all of the above inclusion criteria. Exclusion criteria involved publications beyond the stipulated date range, studies not reporting the terms sustainability and service innovation in the title, abstract, or full text, studies that were not directly related to



**Figure 1.** PRISMA flowchart.

integrating sustainable service innovation into the manufacturing industry, and non-peer-reviewed sources, such as blogs, opinions, and non-scholarly publications, all helping this review maintain scholarly integrity. The other exclusion criteria included full-text articles with language that was not English, for purposes of this study.

### **Data extraction and analysis**

Essential information such as the authors, year of publication, study design, study context/scope, main findings, and recommendations were extracted from selected sources using a standardized form. This structured approach facilitated the organization and comparison of data across different sources (Kitchenham, 2012). The synthesis of information aimed to address the research questions while considering the geographical and contextual diversity of the studies, ensuring that the findings were widely applicable and relevant to the research topic.

## **Results**

### **Distribution of studies by year of publication**

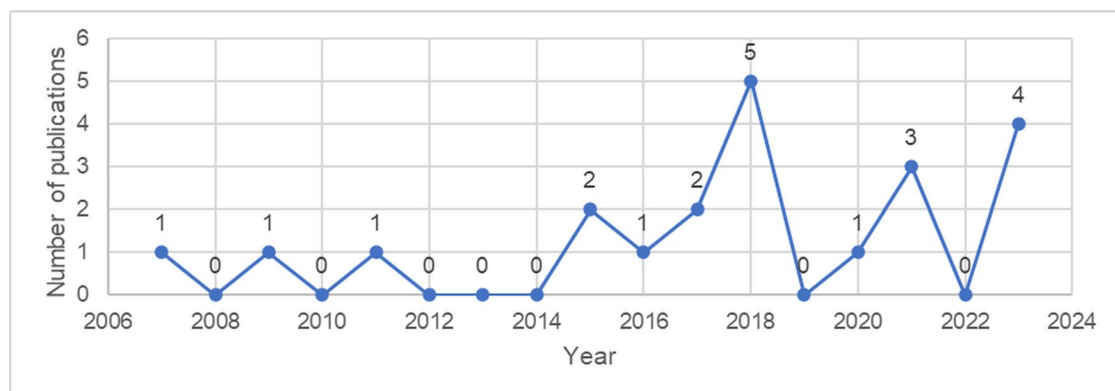
Multiple academic articles focusing on sustainable service innovation have been annually published, predominantly in 2018. This trend underscores the ongoing relevance of research on sustainable service innovation in recent years, as illustrated in Figure 2.

### **Distribution of studies by citation (most cited)**

Figure 3 shows the citation distribution among the papers in this study, highlighting the most influential works in sustainable service innovation. Chen et al. (2015) is the most cited, with 104 citations, underscoring its significant impact on the field. Calabrese et al. (2021) follow with 50 citations, emphasizing the integration of sustainability with service innovation strategies. Wang (2017) and Giannopoulou et al. (2011) also stand out with 28 and 17 citations, respectively, for their contributions to sustainability in service sectors. Papers with fewer citations, such as those by Zhang et al. (2018), Coreynen et al. (2021), and Liu et al. (2023), represent emerging research areas, indicating their growing relevance in the field. This citation analysis highlights key contributions that have shaped the current understanding of sustainable service innovation.

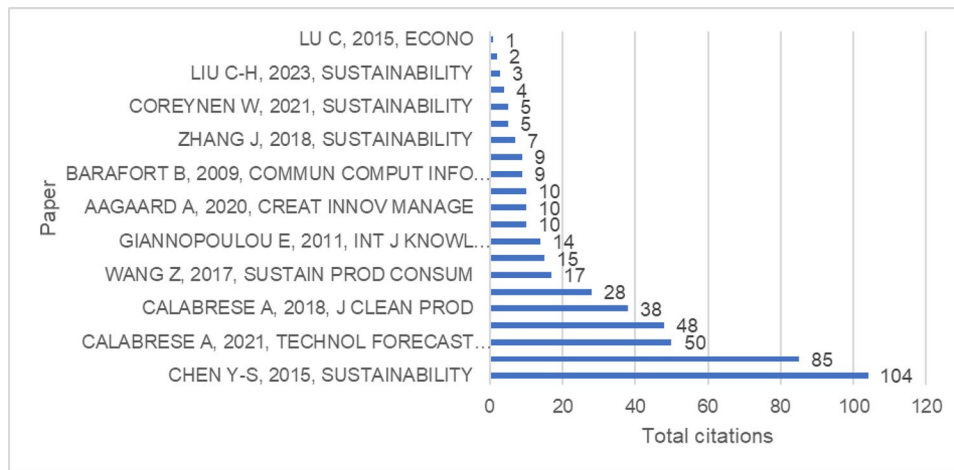
### **Distribution of studies by journal**

By tracing the distribution of studies by journal, it helps identify which journals are the main hubs for research on a particular topic. Based on Figure 4, the journal Sustainability (Switzerland) is the most frequent source, with a total of 5 articles published on the topic, indicating its leading role in disseminating

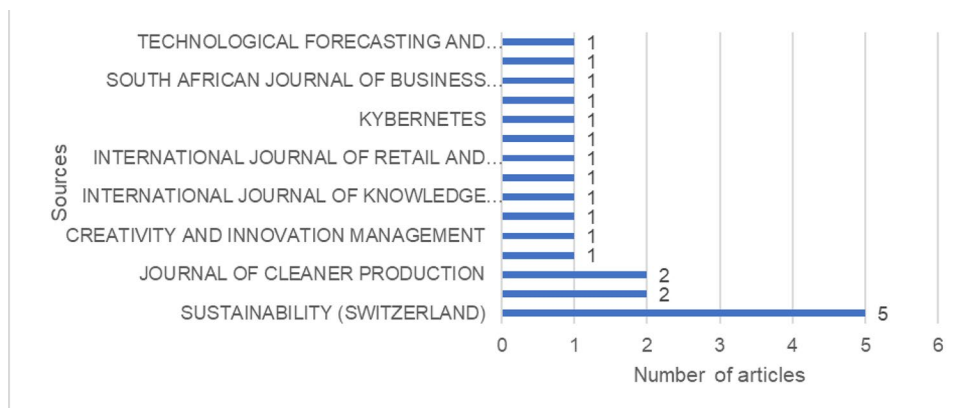


**Figure 2.** Yearly Distribution of Sustainable Service Innovation.





**Figure 3.** Distribution of papers by total citations.



**Figure 4.** Distribution of papers by journal.

research related to sustainability practices and service innovation. Following Sustainability, the Journal of Cleaner Production has contributed 2 articles, reflecting its focus on research that integrates sustainability with industrial practices, including service innovation. Other journals, such as Creativity and Innovation Management, International Journal of Knowledge Management Studies, International Journal of Retail and Distribution Management, Kybernetes, South African Journal of Business Management, and Technological Forecasting and Social Change, each contributed 1 article. This distribution suggests that while a few journals are leading the discourse on sustainable service innovation, there is a diverse range of publications contributing to the field, reflecting the interdisciplinary nature of the research.

### ***Distribution of studies by published countries***

Interpreting this distribution is crucial as it reveals the global engagement and regional focus within the field of sustainable service innovation. It helps identify leading countries driving research and highlights the global collaboration needed to advance sustainability goals. Understanding where the most research is being conducted can guide future collaborations, funding allocations, and policy-making efforts in sustainability.

Figure 5 shows that China leads in sustainable service innovation research with 28 papers, reflecting its strong focus on sustainability. Italy follows with 10 papers, indicating significant research activity. Luxembourg, despite its size, contributes notably with 5 papers. The USA and Sweden each have 4 papers, showing consistent research efforts. European countries like the UK, Spain, and Belgium contribute 3 papers each, highlighting Europe's active involvement. Countries such as France, Finland, and Australia, with 1 paper each, also participate in the global research landscape, though to a lesser extent.

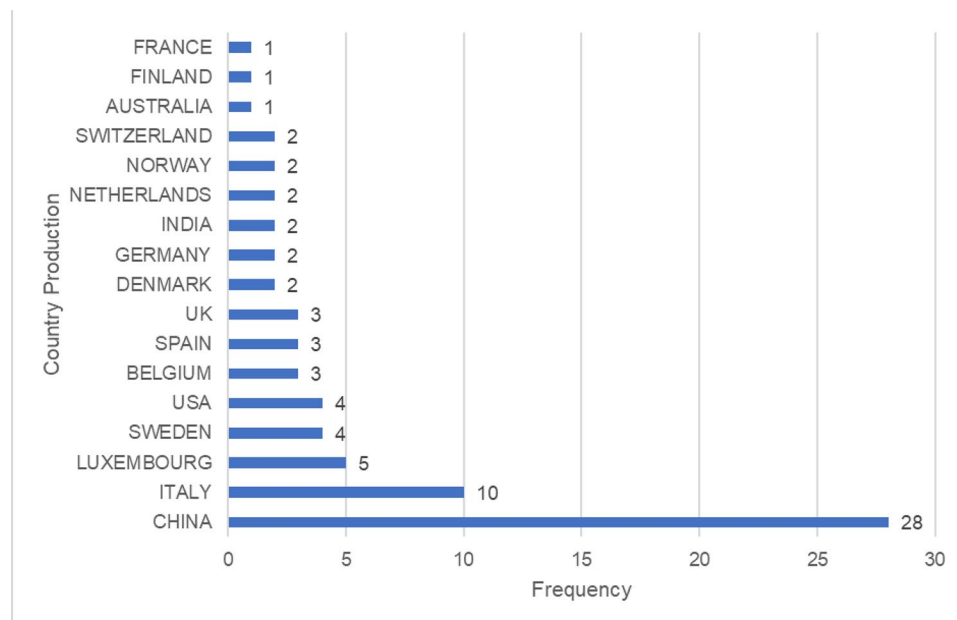


### ***Distribution of studies by methodology***

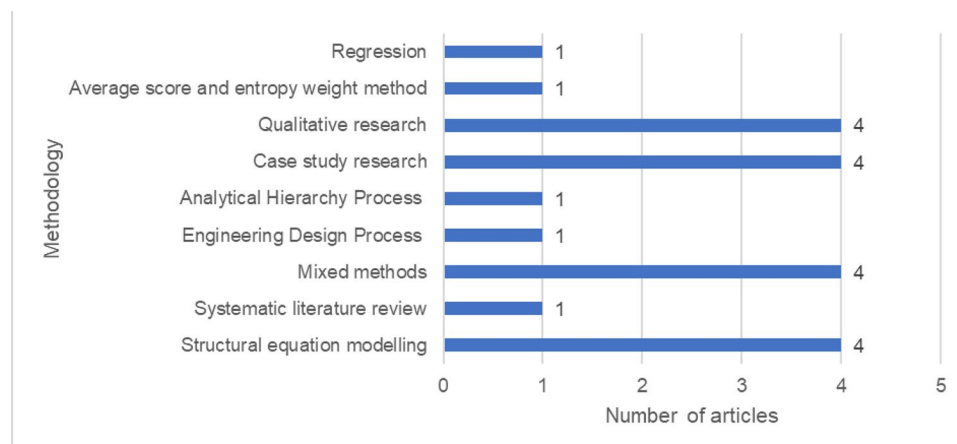
This descriptive analysis is important as it sheds light on the prevailing research approaches in the field, helping researchers to select appropriate methodologies for their studies. It also highlights opportunities to innovate by employing less common methods, which could lead to new insights and advancements in sustainable service innovation.

Figure 6 illustrates the distribution of methodologies employed in sustainable service innovation research. Qualitative research, Case study research, Mixed methods, and Structural equation modeling are the most commonly used methodologies, each appearing in 4 articles. These methods are favored for their ability to explore complex phenomena, provide detailed analysis, and validate theoretical models. Less frequently used methodologies, such as Regression analysis, Average score & entropy weight method, Analytical Hierarchy Process, Engineering Design Process, and Systematic literature review, are each utilized in 1 article. These specialized methods contribute unique analytical perspectives, complementing the dominant approaches.

Additionally, a qualitative analysis was conducted on the 21 chosen articles, as indicated in Table 1.



**Figure 5.** Distribution of papers by published countries.



**Figure 6.** Methodological Approaches Used in Sustainable Service Innovation Research.

**Table 1.** Compilation of selected articles and qualitative synthesis.

Author	Year	Journal	Respondents	Findings	Key determinants
Gil-Saura, I., Ruiz-Molina, M.-E., Marín-García, A., Michel, G.	2023	International Journal of Retail and Distribution Management	510 customers of grocery retail establishments	The findings indicate that SOCI has a direct positive impact on customer satisfaction, as well as an indirect impact through store equity. These effects are also moderated by consumer participation in sustainable and innovative initiatives.	Stakeholder engagement
Liu, C.-H., La, Q.P., Ng, Y.-L., Mamengko, R.P.	2023	Sustainability	454 employees	Results indicated that organizational environments play a crucial role in promoting employee engagement in information sharing and satisfaction, which in turn enhances sustainable service innovation through achievement and improvement. Additionally, the study highlighted the moderating role of pressure in influencing the relationship between achievement and improvement for sustainable service innovation. The study resulted in the development of the INNOSEV scale, consisting of 22 items, to measure service innovation incorporating both technological and non-technological components from the customer perspective across sectors.	Stakeholder engagement and service innovation determinants (organizational culture) Service innovation determinants (technological and non-technological components)
Manohar, S., Paul, J., Strong, C., Mittal, A.	2023	Journal of Business Research	–	The study reveals that environmental, economic, and social sustainability practices significantly impact the process and outcomes of service innovation. Furthermore, the absorptive capabilities of service enterprises positively moderate the relationship between corporate sustainability practices and service innovation.	Sustainability policies (sustainability practices) and stakeholder engagement
Adu-Yeboah, S.S., Jiang, Y., Frempong, M.F., Hossin, M.A., Amoako, R.	2023	South African Journal of Business Management	514 service enterprises	The study highlights the increasing sustainability of service industries and proposes service innovation as a key contributor to achieving emerging sustainability goals within service ecosystems. It advocates for a shift from a shareholder-first doctrine to a collaborative stakeholder perspective, prioritizing profit, planet, and people.	Sustainability policies
van Riel, A.C.R., Andreassen, T.W., Lervik-Olsen, L., (...), Mithas, S., Heinonen, K.	2021	Journal of Business Research	–	The article suggests a shift in focus to when companies achieve sustainable product-service innovation (PSI) growth, which is relevant to the concept of sustainable service innovation. It aims to improve both economic and environmental performance by integrating Multiple Levels (company, environment, individuals) and a mix of qualitative and quantitative Methods in research. This approach is expected to foster the development of sustainable service innovations more effectively, making servitization research a proactive contributor to supporting industry sustainability.	Growth management frameworks
Coreynen, W., van Witteeloostuijn, A., Vanderstraeten, J.	2021	Sustainability	–	The research findings indicate that integrating sustainability and service innovation strategies significantly enhances firms' contributions to the Sustainable Development Goals (SDGs). The study developed an analytical approach using open secondary data and content analysis to evaluate firms' sustainability and service innovation activities. A key outcome was the development of the Sustainability-oriented Service Innovation (SOSI) Matrix, which maps firms' strategies and underscores the critical role of service innovation in facilitating SDG achievement.	Sustainability policies and service innovation determinants (technology)
Calabrese, A., Costa, R., Ghiron, N.L., Tiburzi, L., Pedersen, E.R.G.	2021	Technological Forecasting and Social Change	23 manufacturers from the fast-growing fitness equipment industry	Key findings highlight that SBMs in service involve simultaneous value processes and require integrating value perception into existing sustainable business models (SBMs) frameworks. This dual perspective (providers and customers) enhances understanding of sustainable value proposition, creation, and capture. The study underscores the importance of employee engagement, customer involvement, and targeted communication in implementing SBMs to foster sustainability, aligning with principles of sustainable service innovation.	Stakeholder engagement and service innovation determinants (organizational culture, leadership)
Aagaard, A., Ritzén, S.	2020	Creativity and Innovation Management	–	The study emphasizes the role of Sustainability-Oriented Service Innovation (SOSI) in advancing organizational sustainability within the framework of the 17 Sustainable Development Goals (SDGs). It proposes an engineering design process tool to facilitate the integration of SOSI into business models, aiming to enhance companies' contributions to SDGs through service innovation. The tool assists managers and entrepreneurs in identifying opportunities within their business models to implement and promote sustainable service innovations, illustrated through a case study on zero-emissions mobility services.	Sustainability policies and service innovation determinants (technology)
Calabrese, A., Forte, G., Ghiron, N.L.	2018	Journal of Cleaner Production	–	The research underscores the need for a holistic approach where service innovation and quality improvement are integral parts of transformative processes aimed at sustainability and value co-creation. The article advocates for further research to generalize findings and apply them across diverse empirical settings, emphasizing governance and societal implications in fostering sustainable service businesses.	Stakeholder engagement and service innovation determinants (leadership)

(Continued)

Table 1. Continued.

Author	Year	Journal	Respondents	Findings	Key determinants
Zhang, J., Xie, H., Li, H., (...), Deng, Q., Jin, W.	2018	Sustainability	585 construction enterprise representatives	The research identifies sustainable growth management strategies in service innovation within the construction industry. This study reveals current service innovation levels and development priorities. It develops a growth management framework based on competitive advantage characteristics. While most firms are in a developmental phase with policy opportunities for higher service innovation levels, challenges include insufficient encouragement of employee innovation efforts and inadequate investment in service-related innovation.	Growth management frameworks
Calabrese, A., Castaldi, C., Forte, G., Levialdi, N.G.	2018	Journal of Cleaner Production	–	The study reviews the literature on service innovation and sustainability, highlighting a growing interest in using service innovation to tackle sustainability challenges. It identifies three main research streams—service innovation, product-service systems, and sustainability-oriented innovation—each focusing differently on sustainability and innovation. The review underscores the need for a cohesive approach in sustainability-oriented service innovation research, aiming to guide companies in addressing sustainability challenges through innovative service models.	Sustainability policies and service innovation determinants (technology)
Li, L., Kung, H.-C., Tsai, F.-S., Liu, C.-F., Lu, K.-H.	2018	Sustainability	–	The result highlights the importance of service learning in developing human capital and enhancing service innovation. The paper proposes that service learning positively impacts service climate and service-based social innovation, leading to greater societal sustainability.	Stakeholder engagement
Wang, Z., Subramanian, N., Abdulrahman, M.D., (...), Wu, L., Liu, C.	2017	Sustainable Production and Consumption	5 companies including trade companies and freight forwarding agencies	The findings underscore that sustainable service innovation at ports hinges on meeting diverse user expectations through improvements in infrastructure, cargo safety, and cost reductions. Moreover, enhancing operational efficiencies like reducing paperwork and optimizing e-business contributes to sustainability by minimizing environmental impact and enhancing service quality.	Service innovation determinants (technology)
Chen, C.-L.	2017	Service Industries Journal	–	Studying various service providers, this research illustrates how different service innovation models, particularly those integrating ICT platforms and enhancing customer experiences, contribute to sustainable service innovation. By focusing on improving operational efficiency, customer relationship management, and market competitiveness, these innovations help in meeting evolving consumer needs while promoting economic and environmental sustainability in service delivery.	Sustainability policies and service innovation determinants (technology)
Fichter, K., Clausen, J.	2016	Journal of Innovation Management	100 cases	The empirical investigation identified five distinct groups of sustainable product and service innovations, each characterized by unique diffusion processes influenced by different factors. This differentiation underscores the varied paths through which sustainable innovations spread, offering insights into the factors, actors, and institutional settings that shape their success or failure in the market. This understanding is crucial for informing policies aimed at promoting sustainable innovation across diverse sectors.	Service innovation determinants (organizational culture)
Chen, Y.-S., Lin, Y.-H., Lin, C.-Y., Chang, C.-W.	2015	Sustainability	390 respondents from Taiwanese electronics companies	The study finds that green absorptive capacity has positive effects on green dynamic capacities, green service innovation, and firm performance. It also points out that green dynamic capacities have positive effects on green service innovation and firm performance. Additionally, the study observes that green dynamic capacities and green service innovation mediate the positive connection between green absorptive capacity and firm performance.	Service innovation determinants (technology)
Lu, C.	2015	Economics and Policy of Energy and the Environment	–	The study emphasizes that national sustainability policies significantly drive the development and implementation of sustainable service innovation within public transport systems. These policies foster innovation by integrating responsibility, power, and resources, creating a shared platform that enhances value co-creation opportunities for customers and stakeholders. However, due to its single-case design, the study limits empirical generalizations.	Sustainability policies
Giannopoulou, E., Gryszkiewicz, L., Barlaetter, P.-J.	2011	International Journal of Knowledge Management Studies	–	The research found that service learning positively impacts service climate, promoting a culture of service excellence. This improved climate facilitates social innovations that address sustainability challenges, underscoring the significance of integrating educational practices with practical service initiatives to achieve sustainable development goals.	Sustainability policies
Barafort, B., Rousseau, A.	2009	Communications in Computer and Information Science	–	This study introduces the Sustainable Service Innovation Process (S2IP) model as a generic framework to support innovation and foster multidisciplinary activities. This study also highlights the importance of standardization in enhancing the quality and adoption of services in the market, which supports sustainable service innovation by ensuring continually evolving and standardized innovation processes.	Service innovation determinants (technology)
Gebauer, H., Fleisch, E.	2007	Kybernetes	–	The findings found that manufacturing companies can achieve sustainable service improvements by overcoming cognitive barriers such as risk aversion and overemphasis on tangible aspects. The study highlights the importance of increasing awareness of the economic potential of services, balancing employee motivation with structural processes, fostering value-added service awareness, and focusing on second-order changes to enhance productivity.	Service innovation determinants (leadership and organizational culture)

### ***Theoretical foundation of the integration of sustainability on service innovation***

Integrating sustainability into service innovation is grounded in the understanding that long-term value creation must consider social and environmental impacts alongside economic benefits. Kleindorfer et al. (2005) define sustainable service innovation as 'the development of new services or enhancement of existing services in ways that meet current needs without compromising the ability of future generations to meet their own needs'. This approach underscores the importance of considering the long-term impacts of innovation on both the environment and society. It emphasizes that service innovations should be designed and implemented with sustainability principles in mind, including efficient resource use, carbon emissions reduction, and positive contributions to social well-being (Kleindorfer et al., 2005).

In today's business context, the integration of sustainability and service innovation is increasingly crucial due to heightened awareness of environmental and social issues. Businesses are expected not only to pursue financial profit but also to take responsibility for their operational impacts on the environment and society. Boons and Lüdeke-Freund (2013) demonstrate that sustainable service innovation not only contributes to environmental sustainability but also serves as a key driver in building a positive corporate image and enhancing customer satisfaction. Innovations that consider sustainability can help companies meet stringent regulatory demands and address consumer expectations regarding sustainability issues.

Moreover, integrating sustainability into service innovation can enhance company competitiveness. Y.-S. Chen (2010) notes that sustainable service innovation can improve brand reputation, customer loyalty, and long-term profitability. Companies successfully integrating sustainability principles into their operations tend to be more highly valued by customers, investors, and other stakeholders. Environmentally friendly technologies and sustainable business practices are critical factors in achieving these goals. Chen et al. (2010) highlight that information and communication technology can optimize supply chains, increase transparency, and facilitate collaboration among various stakeholders in sustainable service innovation.

Furthermore, this theory emphasizes the importance of a holistic approach to integrating sustainability into service innovation. This means that companies should consider the economic, social, and environmental impacts of every business decision. This approach aligns with the triple-bottom-line concept proposed by Elkington (1997), which emphasizes that business sustainability must encompass three main aspects: profit, people, and the planet. By adopting this approach, companies can ensure that their service innovations are not only financially beneficial but also make positive contributions to society and the environment.

### **Discussion**

The results of this Systematic Literature Review (SLR) reveal several key determinant variables of sustainable service innovation that have significant implications for practice and research. This discussion will highlight the importance of each variable and the challenges associated with their implementation, based on the filtered articles.

#### ***Stakeholder engagement***

Stakeholder engagement is a key factor in the success of sustainable service innovation. Involving various stakeholders such as customers, employees, suppliers, and business partners in the innovation process ensures that the developed services meet the needs of all involved parties. For instance, Aagaard and Ritzén (2020) illustrated how employee and customer involvement within a large manufacturing firm led to the development of more sustainable and innovative products, effectively aligning with market demands. Active participation of diverse stakeholders not only enhances innovation quality but also increases commitment to sustainable practices.

Stakeholder engagement is included as a determinant variable of sustainable service innovation because it brings diverse perspectives that enrich the innovation process. Each stakeholder possesses unique knowledge and experience that can contribute to creating more innovative and sustainable services. For example, Calabrese et al. (2018) demonstrated that involving suppliers and business partners in the innovation process within the fitness equipment industry introduced new technologies and

methodologies that significantly enhanced service efficiency and sustainability. This involvement ensures that the developed services are more relevant and of high quality. Moreover, Liu et al. (2023) showed that engaging customers early in the process provided insights into market needs and preferences, while employees contributed practical solutions based on their operational experience. This engagement allows companies to better understand stakeholder needs and expectations, thereby creating services that truly meet market demands.

Despite its clear benefits, stakeholder engagement in sustainable service innovation also faces various challenges. One major challenge is aligning the diverse interests and priorities of different stakeholders. For instance, the study by Liu et al. (2023) found that while customers may desire affordable and easily accessible products, employees might focus more on safety and workplace comfort, and suppliers may prioritize production efficiency. Aligning these interests requires effective communication and active engagement from all parties. As demonstrated by Aisi (2022), overcoming these challenges often involves developing clear communication strategies and creating an inclusive environment where all stakeholders feel valued and heard.

Additionally, ensuring active participation from all stakeholders is not easy; some stakeholders may be reluctant to engage due to a lack of understanding about the importance of sustainable innovation or because they feel that their contributions will not be recognized or appreciated. Giannopoulou et al. (2011) showed that transparent communication and the creation of inclusive environments were effective in addressing such challenges, ensuring that all stakeholders actively participated in the innovation process.

Strategies to enhance stakeholder engagement include open and transparent communication, empowering employees, building strong partnerships with suppliers and business partners, and involving customers in the development process. Li et al. (2018) emphasized that companies that maintained open communication with stakeholders and empowered employees to contribute to the innovation process were more successful in developing services that met market demands and achieved higher levels of innovation quality. Moreover, developing strong, mutually beneficial partnerships with suppliers and business partners to drive joint innovation is crucial. Involving customers in the early stages of product and service development ensures that the resulting innovations meet their needs and expectations, thereby enhancing the relevance and quality of the developed services.

### ***Sustainability policies***

Sustainability policies at both organizational and governmental levels provide a strong framework and motivation for companies to adopt sustainable practices. These policies act as key drivers of sustainable service innovation, influencing how businesses operate and integrate sustainability into their daily activities. For example, Lu (2015) highlighted the significant role of government regulations promoting renewable energy use within the public transport sector. This compelled companies to innovate and integrate sustainability into their operations, ensuring that their services were not only effective but also environmentally responsible. Such policies provide the necessary direction and long-term commitment to sustainability, yet, as Chen (2017) noted, companies often face challenges in adopting these policies due to high initial costs and regulatory uncertainties. This was particularly evident in the electronics industry, where the financial burden of investing in green technologies was compounded by unclear regulatory frameworks, leading to hesitation among companies to fully commit to these sustainable practices.

Sustainability policies are considered critical determinant variables of sustainable service innovation because they create an environment conducive to innovation by guiding companies toward long-term sustainable goals. These policies, whether initiated internally by companies or mandated by governments, establish guidelines and provide incentives that encourage businesses to invest in environmentally friendly technologies and sustainable practices. For instance, Lu (2015) described how government policies offering tax incentives for renewable energy investments and enforcing strict emission standards have led companies in the energy sector to seek innovative solutions that comply with these regulations. Additionally, Chen (2017) demonstrated that internal company policies emphasizing sustainability within Taiwanese electronics firms significantly shaped organizational culture. These policies enhanced employee motivation to engage in sustainability initiatives, thus prioritizing environmentally oriented projects and ensuring that sustainability became an integral part of the business strategy.



The role of sustainability policies extends beyond mere guidance; they are also crucial in setting priorities and allocating resources. With clear policies in place, companies can more effectively allocate funds and resources to sustainable innovation projects, ensuring that sustainability efforts are not just ad-hoc initiatives but are embedded within the company's long-term strategy. Giannopoulou et al. (2011) illustrated this in the education sector, where organizations with well-defined sustainability policies were able to prioritize and fund sustainable innovation projects more effectively. This approach not only ensured the continuity of sustainability efforts but also helped manage environmental and social risks, thereby enhancing the company's competitiveness and reputation in the global market.

However, implementing sustainability policies is not without challenges. A major hurdle is the high initial costs associated with investments in green technologies and the operational changes required to meet sustainability standards. Chen (2017) observed that many companies, particularly in the electronics sector, were hesitant to make significant investments without clear evidence of a return on investment. Furthermore, regulatory uncertainty poses another significant barrier. As Chen pointed out, sudden changes in policy or inconsistencies in regulatory enforcement can create an unstable business environment, making companies reluctant to commit to long-term sustainability investments.

To overcome these challenges, companies need to develop flexible and adaptive strategies that allow them to adjust to policy changes and market conditions. Li et al. (2018) discussed how companies in the manufacturing sector successfully built partnerships with governments, non-governmental organizations, and local communities to gain support and mitigate risks associated with sustainability initiatives. These partnerships not only drive innovation but also serve as essential tools for managing change and achieving long-term sustainability. By fostering these collaborations, companies can navigate the complexities of regulatory environments and maintain a competitive edge in the market.

### ***Growth management frameworks***

The framework of sustainable growth management that integrates sustainability principles is essential for organizations seeking to balance expansion with environmental responsibility. Growth strategies that consider environmental impact and employ sustainable business models are crucial in preventing the negative consequences of uncontrolled expansion. Zhang et al. (2018) provided a compelling example in the construction industry, where growth strategies that took into account environmental considerations helped companies avoid the pitfalls of overexpansion, such as resource depletion and increased carbon emissions. This framework allows companies to plan for long-term growth that aligns with their sustainability goals, ensuring that each step taken towards expansion is environmentally responsible and socially beneficial.

A sustainable growth management framework is included as a determinant variable of sustainable service innovation because it offers a structured approach for companies to manage their growth in a way that is both sustainable and strategic. This framework helps identify growth opportunities while ensuring that expansion activities are conducted with due regard for their environmental and social impacts. For instance, Calabrese et al. (2018) discussed how companies in the fitness equipment industry adopted sustainable business models that incorporated environmentally friendly technologies and energy-efficient operational practices. This not only allowed these companies to comply with stringent environmental regulations but also enhanced their reputation among consumers who are increasingly concerned about environmental issues. By adopting such sustainable business models, companies can avoid the risks associated with uncontrolled growth, such as the overexploitation of resources and increased carbon emissions, while also achieving long-term benefits aligned with their sustainability goals.

One of the key aspects of a sustainable growth management framework is its ability to integrate sustainability principles into the company's business model. This includes the use of environmentally friendly technologies, the adoption of energy-efficient operational practices, and the development of product designs that reduce the overall carbon footprint. As Calabrese et al. (2021) highlighted, companies that successfully integrated these principles into their business models were not only able to comply with environmental regulations but also to enhance their market competitiveness. Moreover, sustainable business models often prove to be more economically efficient in the long run, as they reduce operational costs and mitigate risks associated with non-compliance with environmental regulations.

Despite its advantages, implementing a sustainable growth management framework is challenging. One of the biggest obstacles is the resistance to change within organizations that have operated in traditional ways for many years. Chen et al. observed that in the electronics industry, significant initial investments in new technologies and employee training were necessary to transition to more sustainable practices. However, this often led to resistance from employees and management who were accustomed to established practices and were hesitant to adopt new, unproven approaches, despite their potential long-term benefits.

To address these challenges, companies must develop effective change management strategies that include clear communication, employee engagement in the change process, and strong support from top management. Li et al. (2018) found that in the manufacturing sector, companies that clearly communicated the benefits of adopting sustainable practices and actively involved employees in the transition process were more successful in overcoming resistance and achieving their sustainability goals. Support from top management is also crucial, as it provides the necessary direction and resources to implement these changes successfully. Furthermore, companies that foster a culture of innovation and sustainability within their organizations are better positioned to overcome internal resistance and drive the adoption of sustainable growth practices.

A sustainable growth management framework also plays a critical role in addressing external challenges, such as regulatory changes and market pressures. Companies with flexible and adaptive frameworks are better equipped to respond to shifts in environmental regulations and capitalize on emerging market opportunities related to sustainability. Wang et al. (2017) demonstrated this in the port industry, where companies with sustainable growth strategies were able to quickly adopt new technologies and participate in global sustainability initiatives, thereby enhancing their competitiveness in the international market. These companies were able to maintain their leadership positions by staying ahead of regulatory changes and aligning their growth strategies with global sustainability trends.

### ***Service innovation determinants***

Several specific factors drive sustainable service innovation, including organizational culture, leadership, and technology. A company culture that supports innovation is crucial in creating an environment conducive to sustainability. Organizations that promote an innovative culture are more adaptive to market and technological changes and are better able to develop creative solutions that support sustainability goals. For example, Calabrese et al. (2021) found that organizations in the fitness industry with a strong culture of innovation were more successful in developing sustainable service innovations that met both market demands and environmental standards. An inclusive and collaborative culture, as Liu et al. (2023) noted, enhances employee engagement in the innovation process, leading to improved operational efficiency and sustainability of services.

Visionary leadership that supports change is another critical factor in driving green initiatives within organizations. Leaders who can inspire and motivate employees to participate in sustainability initiatives are essential for the success of sustainable service innovation. Aagaard and Ritzén (2020) provided an example in the manufacturing sector, where visionary leadership was instrumental in guiding the organization towards adopting sustainable practices and achieving long-term sustainability goals. Similarly, Enquist and Sebhatu (2018) discussed how effective leadership in the service industry can foster an organizational culture that prioritizes sustainability, helping to align short-term objectives with long-term environmental goals.

The use of technology to enhance the efficiency and sustainability of services is also a key determinant of sustainable service innovation. Investments in environmentally friendly technologies provide innovative solutions that help companies achieve their sustainability goals while also enhancing their competitiveness. Chen et al. (2015) illustrated this in the Taiwanese electronics industry, where companies that invested in green technologies, such as renewable energy and advanced waste management systems, were able to reduce their environmental impact while increasing productivity and operational efficiency. Moreover, Wang et al. (2017) highlighted the role of information and communication technology (ICT) in optimizing supply chains, improving transparency, and facilitating collaboration among various stakeholders in sustainable service innovation within the port industry. These examples demonstrate that technology not only helps



companies meet environmental regulations but also allows them to develop new products and services that are more sustainable, thereby gaining a competitive advantage in the market.

### ***Research's contributions***

One of the key contributions of this research is the comprehensive mapping of existing studies on sustainable service innovation, achieved through a Systematic Literature Review (SLR) that spans a broad range of publication years. This approach allows for the identification of key determinants driving sustainable service innovation, providing a deep understanding of the factors essential for its successful implementation within the petrochemical industry. The study further contributes to the field by offering detailed insights and practical guidelines, aiding in the adoption of sustainable service innovation strategies that can enhance customer loyalty in this sector.

### ***Managerial and policy implications***

This research offers several key implications for managers, policymakers, and other stakeholders within the petrochemical industry. For managers, the study underscores the necessity of fostering an organizational culture that not only supports but actively drives sustainable service innovation. This involves encouraging employees to engage in the innovation process and creating a work environment that promotes collaboration, creativity, and a shared commitment to sustainability. Specifically, managers in petrochemical companies (such as Pertamina Patra Niaga, Saudi Arabian Oil Co, China Petroleum & Chemical Corp, PetroChina Co Ltd, Exxon Mobil Corp, and Shell) must prioritize sustainability by integrating it into their core business strategies. For example, these companies can focus on reducing their carbon footprint through the development of eco-friendly products, investing in renewable energy sources, or adopting circular economy practices. Effective communication and leadership are also crucial; managers must articulate the strategic importance of sustainability and secure the necessary resources to overcome resistance to change. These strategies not only improve the company's environmental impact but also enhance its market competitiveness and brand reputation.

For policymakers, the research highlights the importance of crafting and enforcing sustainability policies that promote and incentivize sustainable service innovation. These policies could include tax incentives for companies investing in green technologies, subsidies for research and development in sustainable practices, or stringent regulations on emissions that drive companies to innovate. Policymakers need to ensure that regulations are stable and consistent, providing a predictable framework within which petrochemical companies can plan long-term investments in sustainability. Moreover, by fostering public-private partnerships, policymakers can encourage the sharing of best practices and innovations across the industry, benefiting a wide range of stakeholders including the public, environmental advocacy groups, and future generations.

The findings of this study are particularly beneficial to key stakeholder groups within the petrochemical industry, including top management, operational teams, investors, and regulatory bodies. For example, petrochemical companies has adopted sustainability strategies such as integrating digital technologies for real-time monitoring of emissions or switching to renewable energy sources, demonstrating how these innovations can be successfully implemented to achieve both environmental and economic goals. This study serves as a roadmap for these and other companies aiming to balance sustainability with profitability, offering practical insights into how sustainable service innovations can be leveraged to improve overall organizational performance.

### ***Conclusions***

This research identifies and analyzes key factors driving sustainable service innovation in the petrochemical industry, including stakeholder engagement in innovation processes, sustainability policies, growth frameworks, and determinants of service innovation itself (such as organizational culture, leadership, and technology). By integrating sustainability principles into business models and growth strategies, companies can enhance competitiveness, reduce environmental risks, and build stronger relationships with

stakeholders. This study provides valuable insights for managers and policymakers on how to promote and implement sustainable service innovation to achieve long-term sustainability goals. Furthermore, the findings underscore the importance of a holistic approach to sustainability, which not only addresses regulatory compliance but also drives proactive measures in corporate social responsibility (CSR) and environmental stewardship. The comprehensive analysis presented in this research offers a roadmap for petrochemical companies to navigate the complexities of sustainability while maintaining customer loyalty and ensuring economic viability in a rapidly evolving market.

### **Research limitations and future research directions**

This research has several limitations that need to be acknowledged. Firstly, it is confined to literature available in English and may not encompass relevant research in other languages. Secondly, the study uses an SLR methodology dependent on the availability and quality of published data, which means that some pertinent information may not be included. For future research, it is recommended to broaden the scope by incorporating literature in various languages and exploring other industry sectors to gain a more comprehensive understanding of sustainable service innovation. Further research could also explore the specific impacts of various government policies and environmental regulations on sustainable innovation practices across different geographical and industrial contexts. Additionally, empirical studies involving surveys and interviews with practitioners in the field could provide deeper insights into the challenges and best practices in implementing sustainable service innovation.

### **Author contributions**

- Oos Kosasih: Conceptualization, Data Curation, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Resources, Software, Supervision, Validation, Visualization, Writing – Original Draft, Writing – Review & Editing.
- Kadarisman Hidayat: Data Curation, Formal Analysis, Investigation, Methodology, Validation, Writing – Original Draft, Writing – Review & Editing.
- Benny Hutahayan: Visualization, Investigation, Writing – Review & Editing.
- Sunarti: Supervision, Validation, Writing – Review & Editing.

### **Disclosure statement**

No potential conflict of interest was reported by the author(s).

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## Data availability statement

Data are available upon request from the authors (mail to [okosasih@student.ub.ac.id](mailto:okosasih@student.ub.ac.id)).

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