International Journal of Physical Distribution & Logistics Management

653

Embracing methodological evolution and diversity in logistics and supply chain management research

Ivan Russo and Ilenia Confente
Department of Management, University of Verona, Verona, Italy
Jan Holmström
Department of Industrial Engineering and Management, Aalto University, Helsinki, Finland
Mikael Öhman
Department of Marketing, Hanken School of Economics, Helsinki, Finland, and
Travis Tokar
Department of Info Systems and Supply Chain Management, Texas Christian University, Fort Worth, Texas, USA

Received 15 May 2024
Revised 29 July 2024
Accepted 30 August 2024

Abstract

Purpose – The purpose of this research is to highlight the significance of advancing research methodologies in logistics, operations and supply chain management. It seeks to expand the scope of research questions and explore areas previously constrained by traditional methodological approaches, thereby enhancing the exploration of complex, real-world business issues.

Design/methodology/approach – This commentary introduces and discusses the special issue on "Advances in Research Methodologies for Logistics and Supply Chain Management," exploring methodological innovations, diversity and their potential to address complex business and disciplinary challenges. The commentary assesses a broad spectrum of methodologies, ranging from traditional qualitative and quantitative approaches to overlooked methods such as qualitative comparative analysis, netnography, design science, Bayesian networks, machine learning and repertory grid technique. This diverse methodological approach enables a comprehensive examination of emerging and ongoing challenges in the supply chain. In the final summary section, we highlight additional areas of research method innovation not covered in this special issue, offering a broader perspective on future directions for methodological advancements in SCM research.

Findings – The findings suggest that integrating less explored methodologies from various disciplines encourages a richer, multi-level analysis of the supply chain management landscape. This integration facilitates a deeper understanding of emerging challenges, such as geopolitical issues, global supply chain disruptions and the integration of new technologies. Additionally, the exploration of 'white space' in research methodologies indicates significant potential for discovering new insights that bridge practical problems with theoretical contributions.

Originality/value – The value of this methodological diversity extends beyond academic enrichment. It catalyzes the generation of innovative insights crucial for business practitioners, policymakers, consultants and academics. By adopting varied research designs and methodologies, the research note can offer a broader

International Journal of Physical Distribution & Logistics Management
Vol. 54 No. 7/8, 2024
pp. 653-672
Emerald Publishing Limited
0960-0035
DOI 10.1108/IJPDLM-05-2024-0205

spectrum of analytical perspectives, crucial for uncovering nuanced insights into complex, cross-cultural and relationship-based dynamics in supply chain research.

Keywords Advances in research methodologies, Innovative methodologies, Methodological diversity, Supply chain management and methodologies

Paper type Research paper

Introduction

Advancements in research methodologies are crucial for progress in logistics, operations, and supply chain management research. This commentary, introducing the Special Issue on "*Advances in Research Methodologies for Logistics and Supply Chain Management*," explores significant methodological innovations and their role as catalysts for broader inquiry and addressing complex business and disciplinary challenges. By championing innovative methodologies, this issue seeks to expand the scope of research questions and explore areas that still need to be addressed due to traditional methodological constraints.

Despite various methodological opportunities, supply chain management (SCM) remains entrenched in traditional practices. New approaches are essential to address and solve today's complex challenges (Wong *et al.*, 2021). This exploration advocates a shift from conventional methodologies to embracing a broader spectrum of less common but highly effective research strategies, as we hosted in this SI. The diversity of these methods is not merely a scholarly indulgence but a pragmatic necessity, enabling deeper and more nuanced exploration of established questions while unlocking new avenues for inquiry and application. The evolution of SCM practices is increasingly influenced by a range of transformations driven by emerging challenges and real-world business issues. These challenges span from the advent of new retail business models in the era of omnichannel commerce to geopolitical issues (such as global supply chain risks, matters related to workers' well-being across operations and logistics activities), to the imperative of more sustainable practices, and the push towards circular economy principles.

Furthermore, technological innovations, especially the integration of artificial intelligence, are fundamentally altering operations and logistics at both micro and macro levels. A multifaceted approach is required to address these challenges, and this special issue hosted papers to provide specific answers in terms of advanced methodologies. Moreover, this special issue presents additional opinions by the guest editors, emphasizing the importance of methodological advancements. Our commentary is structured to provide an overview and evaluation of the advancements in research methodologies for SCM. Finally, we will suggest additional areas of research method innovation that future research could cover.

To provide a foundation for the need for new methodological approaches, we conducted a descriptive analysis of manuscripts published between 2019 and 2023 in six prominent journals in the field. This analysis, detailed in the Appendix, reveals trends in methodological approaches and underscores the necessity for methodological innovation and diversity. These insights were invaluable for the Guest Editors in elaborating on advancements in research methods, emphasizing the necessity of methodological innovations in the field.

In developing this SI, we begin with an introduction highlighting the contribution and value of the papers accepted for publication in this special issue. Subsequently, we will focus on three key methodologies that we found particularly compelling and on which the SI was based on: Qualitative Comparative Analysis (QCA), Design Science, and Experimental Methods.

In the final summary section, we will highlight additional areas of research method innovation that this special issue has not covered, offering a broader perspective on the future directions for methodological advancements in SCM research. It is important to note that our commentary is not exhaustive of all advancements but aims to provide a focused and

insightful examination of selected methodologies. This serves as a stimulus for new contributions, encouraging further research and innovation in the field.

Content of this special issue: innovative, diverse, and advanced methodological approaches

This special issue features six high-quality articles, each addressing critical gaps with innovative, diverse, and advanced methodological approaches. We aim to demonstrate how these cutting-edge methodologies can produce timely and impactful research. The following sections explore how each paper enriches and diversifies SCM methodological approaches, promising groundbreaking theoretical and empirical insights.

Exploring nuances through interviews and QCA: why the recipe matters more than the ingredients

The first paper of SI on "Advances in research methodologies for logistics and supply chain management" by Malik and Ali (2024) introduces configurational theorizing as an approach to developing middle-range theory in the context of supply chain resiliency. It proposes a critical realism-informed, five-phase roadmap empirically tested through qualitative data from 22 food supply chain organizations. This research reveals that coopetition and supply chain collaboration are essential for resilience, needing augmentation by supply chain agility or a multi-sourcing strategy.

Significantly, the research employs QCA with qualitative data from interviews, diverging from conventional QCA practices that primarily use surveys or quantitative data. This novel application for the SCM field addresses a critical research gap by leveraging qualitative insights to deepen understanding of complex phenomena, offering a richer exploration of causal mechanisms and advancing theory development in SCM.

The findings identify three configurations that offer various pathways to resilience, enabling managers to adapt strategically based on their resource and capability portfolios. This insight suggests that high resilience can be achieved without multi-sourcing or agility, allowing for strategic resource optimization. Additionally, the asymmetrical analysis provides a nuanced understanding of critical capabilities' impacts on resilience, guiding managers in resource allocation, especially under constraints.

From unresolved challenges to effective solutions: applying CIMO-design logic in problem solving

In the special issue call, we welcomed SCM studies that showcase the use of CIMO-design logic to frame the research problem and specify the contribution to SCM literature. In response to this call, we got a paper authored by Gupta *et al.* (2024). The paper makes a methodological contribution by elaborating on the combination of Thinking Process Tools from the Theory of Constraints and CIMO-design logic, first presented by Groop *et al.* (2017). The authors address a wicked problem: improving service while reducing spare parts distribution costs. The authors demonstrate in detail the methodological use of Thinking Process Tools for problem framing and solving and CIMO-design logic for identifying the contribution to the research literature.

In the call, we were also interested in papers showcasing the development of innovative operating methods using methodologies that establish pragmatic validity in ways other than field testing. In the call, we provided an example (Öhman *et al.*, 2021), relying on a combination of case research methodology and simulation modeling. We did not receive this contribution, leaving room for future methodological papers to elaborate on the design science approach in case studies.

Old but gold approaches: advancements in PLS-SEM analysis

The third work published in this SI by Wang *et al.* (2023) highlights the pivotal role of Partial Least Squares Structural Equation Modeling (PLS-SEM) in analyzing complex relationships across various fields, noting its increased adoption over the last decade due to advancements and the availability of user-friendly software. Specifically, in logistics and SCM, foundational work by Peng and Lai (2012) and Kaufmann and Gaeckler (2015) has demonstrated the method's utility alongside significant methodological progress, including new prediction metrics and model fit criteria. However, awareness of these advancements among SCM researchers appears limited, prompting a need for updated guidance.

To address these limitations, the study conducts a deep dive into the use of PLS-SEM within SCM through an analysis of 401 empirical studies from major journals in the field from 2014 to 2022. This assessment benchmarks the method's application, sheds light on its evolving use, and showcases a marked increase in PLS-SEM's adoption. It serves as a valuable addition to the 2006 seminar paper by Shah and Goldstein on SCM. This reflects its critical role in advancing SCM research by fulfilling the demands of academic rigor and practical application, underscoring the method's adaptability and analytical depth.

By expanding and contrasting evaluation criteria with past findings, this study provides a nuanced view of PLS-SEM's development in SCM, identifying areas for further exploration. It serves a dual purpose: academically, by offering fresh guidelines and insights for researchers, and practically, by aiding journal editors and reviewers in ensuring the publication of high-quality research. Ultimately, this review enhances the comprehension of PLS-SEM's application in SCM and anticipates its continued influence and integration into future research endeavors within the field (Cheah *et al.*, 2023).

Highlighting the value beyond SEM serves as a guide for comparing techniques and promoting transparent result reporting (Sarstedt *et al.*, 2024). This approach fosters scientific progress by encouraging the acknowledgment of uncertainty and the gradual refinement of research practices through diverse and complementary analytical perspectives (e.g. PLS-SEM and QCA, i.e. Gligor *et al.*, 2022; or PLS-SEM and Bayesian Network, i.e. Vishkaei and De Giovanni, 2024, an article included in this SI).

The impact of new technologies in advancing SCM research

The study by Vishkaei and De Giovanni (2024) employed the Bayesian Networks (BNs) methodology with the goal of investigating the impact of digital technologies on Logistics Service Quality (LSQ), offering a sophisticated tool for understanding complex relationships. Within the BN framework, cluster analysis emerges as a potent method, employing Machine Learning (ML) techniques for identifying patterns across various dimensions such as sector, firm size, or geography. This approach broadens the scope of traditional BN analyses, enabling deeper exploration of data and yielding richer insights.

By leveraging BNs alongside ML algorithms, the study probes the direct effects of Digital Technologies for Analytics (DTA) and Digital Technologies for Immersive Experiences (DTIE) on LSQ and indicates strategic directions for logistics service providers in technology investment. The inclusion of emerging technologies further extends the research horizon, suggesting new areas for future inquiry.

In addition, the study provides researchers with a methodological flowchart encompassing six steps for implementing this approach.

These range from data preparation and discretization to building and learning from the BN to analyzing the scenario and related findings. Scholars interested in implementing the BN approach to the SCM domain can follow these guidelines to apply this method successfully.

In sum, the paper demonstrates the value of integrating advanced BN methodologies with empirical techniques, paving the way for more nuanced analyses in the logistics field. This

approach enhances the academic understanding of digital technology's role in improving LSQ and offers practical insights for the industry, underscoring the study's dual contribution to theory and practice.

From big to small data: netnography and digital qualitative methods for SCM research

The study by Rynarzewska and Giunipero (2024) of this SI represents a valuable guideline for scholars who aim to investigate an SCM phenomenon in depth via a netnographic approach.

Compared to the ethnographic approach, this method is a qualitative research technique that involves the study of communities, networks, their culture, interactions, conversations, and content in the online context, such as online communities and social media platforms (Kozinets, 2019). This research method seeks to provide SCM scholars a roadmap for successfully developing an effective netnographic process they can follow, starting from the research questions, identifying and engaging with an appropriate online community, and immersing themselves in studying communication dynamics and other factors. Other essential aspects need to be defined to conduct research via this approach, e.g. the role played by the researcher, which could be more inside or outside the community depending on their familiarity with that community or the need to capture the essence of discussions through an immersive journal. These notes capture personal thoughts on the community, describe community interactions, and any artifacts that may have led to communities' intense responses.

The increasing importance of online communities in supply chain research is evident. As opposed to ethnography, which is a method limited by geography, netnography is well-suited for this purpose. For instance, logistics and supply chain professional groups with vast membership offer abundant online data sources for researchers to use.

Future research utilizing netnography can enhance academic understanding in SCM, where interactions among different actors occur, to better understand the connections and mechanisms of the culture in SC communities. Furthermore, existing research employing netnography offers guidance for future studies, allowing researchers to explore emerging themes in online forums to enrich their findings and better understand the culture, behaviors, and dynamics of the relationship between supply chain partners.

Beyond being adopted as a stand-alone method, netnography can also be an excellent choice for a mixed method approach or as a follow-up study to deepen knowledge of what was found in prior research or a precursor study to develop propositions that could be tested from future research.

Advancing qualitative research in supply chain management: the role of repertory grid technique

The work of Martins *et al.*, (2024) introduces an insightful approach to Operations and Supply Chain Management (OSCM) by integrating the Repertory Grid Technique (RGT) and Honey's Content Analysis (HCA). Employing empirical data from 40 interviewees across two organizations demonstrates how these methodologies enhance the rigor of qualitative research and aid in developing OSCM models. Future research could extend these techniques to complex networks, including circular economy, sustainable operations, healthcare operations management, and humanitarian operations. Longitudinal studies exploring different environmental contexts will further enrich our understanding and provide deep insights from various theoretical perspectives. Future research should explore the Repertory Grid Technique's potential to capture the intricacies and dynamism of phenomena traditionally overlooked in interpretive studies (Darby *et al.*, 2019). Focusing on these neglected aspects within various supply chain contexts will enrich the discipline with a more comprehensive and nuanced understanding, better equipping researchers to address

contemporary supply chains' complex challenges. It will also investigate not only why projects or initiatives succeed but also why they fail.

Methodological advancements: a focus on three research approaches

As we navigate the dynamic landscape of SCM research, we witness the adoption and exploration of novel methodological paradigms borrowed from diverse disciplines, including marketing, psychology, sociology, political science, information systems, organizational science, and environmental/ecological science. Our view underscores that today, SCM researchers are well-positioned to align novel research questions and problems with methodological advancement. Such diversity allows for multi-level analysis (covering individuals, functions, organizations, and supply chain networks), which is essential to capture the complexity of real-world problems fully (Carter *et al.*, 2015; Svanberg, 2020).

In fact, it catalyzes the generation of innovative insights that are immensely valuable to business practitioners, policymakers, consultants, and academics. By adopting a wider array of research strategies, the field of SCM can achieve more robust and impactful outcomes, driving both theoretical advancements and practical solutions.

Exploring the 'white space' in advanced methodologies and research methods is not a new challenge, but it underscores the importance of adopting varied research design approaches beyond traditional large-scale surveys. Embracing such methodological diversity allows for a deeper understanding of complex, ill-structured logistics issues by emphasizing relevance through direct organizational engagement (Chandrasekaran *et al.*, 2020; Hasle and Vang, 2021; Wieland *et al.*, 2024).

In the following section, the Guest Editors have selected and discussed potential venues for specific methodological approaches to push the discipline to discover and validate new boundaries that still need to be fully captured or explored. In doing so, we have focused our attention on the methodological approaches that were outlined in the SI call, namely qualitative comparative analysis, design science, and experimental design.

Methodological advances for QCA

Qualitative Comparative Analysis (QCA) uniquely combines qualitative investigation with quantitative analysis, using a configurational approach to explain complex phenomena in SCM. Consider this scenario: one customer reports high satisfaction with a supplier's flexibility, responsiveness, order accuracy, and timeliness yet has no intention of repeat purchasing. Another customer, conversely, expresses dissatisfaction with the supplier's timeliness but satisfaction with other aspects and plans to continue purchasing. Traditional symmetric research methods often struggle to address such paradoxes due to their inability to handle business interactions' complexity and varied outcomes. QCA, by contrast, allows for a more nuanced exploration of these scenarios, revealing underlying mechanisms and facilitating a deeper understanding of multifaceted relationships.

Recent applications of QCA in SCM, as noted by Arellano *et al.* (2021), Gligor *et al.* (2020), and Russo *et al.* (2019), aim to transcend traditional analyses that focus solely on direct effects between variables. Instead, these studies leverage QCA to identify configurations of factors that contribute to specific outcomes, thus enhancing the practical relevance of research findings to SCM practitioners.

This shift towards context-specific studies is crucial for developing a granular understanding of phenomena, as Craighead *et al.* (2016) and Ketchen *et al.* (2022) emphasized.

Despite these advancements, using QCA with qualitative data (primarily interviews) remains underexplored within the SCM field. Recent works (Malik and Ali, 2024; Woelfl *et al.*, 2023) illustrate significant methodological progress by integrating QCA with qualitative

interviews, which can provide contextualized causal explanations and enhance theoretical and practical understanding of SCM complexities.

This is an interesting venue for further research where methodological papers on QCA derived from qualitative information are welcome regarding methodological guidelines that help scholars code and calibrate qualitative information. By employing QCA in an abductive approach to empirical theorizing, scholars in the field of SCM can reassess and reexamine existing concepts. This methodology not only facilitates the addition of new knowledge but also supports the recontextualization and refinement of theoretical frameworks in response to evolving empirical data and business context.

Furthermore, exploring longitudinal configurational studies could offer insights into how strategic configurations evolve within and across SCM networks. This approach would be particularly valuable in unstable environments, where understanding the temporal dynamics of supply chain configurations is critical. A configurational approach could help capture incremental knowledge with more granular results (Franke *et al.*, 2024).

Additionally, an overlooked approach and an opportunity for SCM research is to employ QCA to examine pathways to success and understand failure. By investigating why specific configurations succeed while others do not, future research can explore the solution configurations and the corresponding situational contexts that lead to the failure of certain SCM choices/strategies. This nuanced approach would allow for a more comprehensive understanding of the factors contributing to both successful and unsuccessful supply chain outcomes (i.e. dissatisfaction, logistics innovation failure, under-performed processes, or SC outcomes), providing deeper insights into effective SCM practices. Such an approach can yield critical insights into the complex interplay of factors that guide the strategic decisions in SCM, thereby enhancing supply chains' robustness, responsiveness, agility, and resilience against a backdrop of global uncertainties and market uncertainty.

Moreover, we recommend comparing outcomes using different methods to elucidate the differences between symmetric methods like Multiple Regression Analysis (MRA) and asymmetric methods such as QCA, or between Structural Equation Modeling (SEM) and QCA (Nikookar *et al.*, 2024). An initial contrarian case analysis could identify anomalies in the data, thereby deepening our understanding of the prevalent asymmetrical relationships among variables. These insights highlight the need for methodologies that capture the complex, non-linear, and multifaceted relationships inherent in supply chain phenomena.

Looking ahead, the debate between intermediate and parsimonious solutions in QCA offers another fruitful area for research (Glaesser, 2023; Haesebrouck, 2023). Intermediate solutions provide detailed insights into core and peripheral conditions, while parsimonious solutions aim for broader applicability. Investigating how these solutions can be used in moderation analysis within QCA could clarify causation and outcome relationships, thus further enriching SCM research.

Overall, this commentary advocates for a broadened methodological perspective that includes using QCA to investigate moderation effects and conjunctural causation (Ma *et al.*, 2024), aiming to significantly enhance the methodological toolkit available for tackling the complexities of global supply chains. This approach seeks to provide more detailed insights into the causal mechanisms underpinning different capabilities in supply chains or characteristics of individual managers. Such insights contribute to theory development by identifying and validating moderated configurational relationships among causal factors, thereby facilitating the navigation of the complexities inherent in global supply chains.

Methodological advances for design science research

CIMO-design logic is a versatile method, building on the theoretical foundations of the role of technology in society and the economy (Simon, 2019; Arthur, 2009). It was first used as a

methodology in the work of critical realists in the field of evaluation studies (Pawson and Tilley (1997). More recently, design logic has been used to conduct systematic literature reviews (Denyer *et al.*, 2008) and in design science research for developing and presenting design propositions and identifying the contribution to literature (Holmström and Romme, 2012).

From a design science perspective, SCM is a challenging field. Complex multi-actor environments with potentially diverging incentives (Tanskanen *et al.*, 2015) force us to reflect on the core issues of the methodology. First, how is design (as a verb) manifested in this context, and how can we, as researchers, engage in it or be part of it? Second, how should we study emergent properties, designs' evolution, and their related outcomes, especially long-term ones? Third, given that design science rests on a pragmatist epistemology, how do we evaluate pragmatic validity in the field of SCM?

Addressing these questions, we point SCM researchers to seek guidance and methodologies from three distinct directions. Action research and scholarly engagement provide methodological guidance and methods for engaging in and being part of problem framing and solving. Explorative design science provides direction for the evolution of design and emergent opportunities enabled by technological developments (Holmström *et al.*, 2009). For evaluation, critical evaluation methodology gives direction (Pawson and Tilley, 1997; Henfridsson and Bygstad, 2013).

As in action research (Coughlan and Coghlan, 2002; Näslund, 2002), engaging with practice is at the heart of design science (Sein *et al.*, 2011). In making sense of a problem or opportunity faced by practice, the design scientist relies on their (boundedly rational) existing view of theory (Aken, 2004). Through a process of framing and re-framing, experimentation, and iteration, the limitations of the existing view of theory tend to become apparent (Gauss *et al.*, 2024). Through engagement, the designer explores the boundaries or interfaces of the problem/opportunity (Simon, 2019), understands different stakeholder views and assumptions (Aken, 2004), and discovers context-specific mechanisms that may limit the direct generalization of the design. Further, engagement with practice extends the notion of design from object design (the intervention) into realization design (how to implement) and process design (how to design) (Aken, 2004).

Explorative design science is not a methodology in the traditional sense of procedures or techniques but a methodological approach (Holmström *et al.*, 2009). This approach aims to create theoretical insights by exploring the design space of potential technology uses, resulting in novel problem-framing rather than mere problem-solving. By distinguishing design research in SCM that contributes new relevant problems (new research directions) from those offering novel solutions (practical relevance), we encourage authors to critically assess and elaborate on their choice of methods to facilitate exploration. Rather than adopting formalized design science methods from other fields, such as information systems research, SCM researchers should aim for methodological advances and new opportunities for exploring technology-enabled changes in SCM through design (Simon, 2019).

Design logic and a detailed understanding of technology provide a methodological foundation for evaluating pragmatic validity (Holmström and Romme, 2012). When a novel solution design builds on pre-existing and field-tested technological elements, a theory-based understanding of how the components function as a combination becomes a method for establishing expected outcomes. Using CIMO-design logic, we specify the problem context (C), the novel combinatorial design intervention (I), the mechanisms of how the intervention works in the problem context (M), and what the expected outcomes (O) are. This theory-based expectation, if not actualized when the intervention is implemented, prompts seeking both a new theoretical understanding (Oliva, 2019) and improved solutions (Groop *et al.*, 2017). Unexpected, beneficial outcomes can be the basis for both innovative designs and new theories (Stark *et al.*, 2023).

Methodological advances for experimental design research

In recent years, the issue of methodological rigor has been at the forefront of discussion amongst those conducting experiment-based research in SCM. Two prominent examples are the works of Lonati *et al.*, (2018) and Eckerd *et al.* (2021). Out of these discussions has emerged a greater understanding of how to design experiments for both rigor and relevance, as well as a deeper appreciation for important trade-offs one must consider when approaching the design decision. These contributions alone make these papers must-reads for anyone seeking to conduct experiment-based research and publish in SCM journals. However, both papers touch on a second methodological issue that has thus far yet to be appreciated. Namely, both papers highlight the fact that there are many innovative experiment methodologies that, to date, are rarely seen in SCM research yet hold tremendous potential for addressing novel and practically relevant research questions.

Lonati *et al.* (2018) specifically draw attention to the tremendous opportunity for impactful research available through quasi-experimental designs. While random assignment of subjects to treatment conditions is generally an essential component of a rigorous experiment, there are certain scenarios in which this is not possible. Yet, the research environment offers such potential for insight that an experiment is nonetheless desirable. An example might include a field setting in which company managers are open to cooperating with researchers on a study but are unable or unwilling to randomly assign individuals, teams, or facilities to a treatment. Lonati *et al.* (2018) discuss three designs for approaching such settings: Difference-in-Differences, Regression Discontinuity, and Synthetic Control Methods.

Eckerd *et al.* (2021) highlight the opportunity for theory testing that could be unlocked through technological advancements that enhance realism in experiment settings, particularly scenario-based role playing (vignette) experiments. As settings become more realistic through the creative use of audio and video technology, or even immersive through virtual reality settings, the ecological validity of such studies is greatly enhanced over those using traditional text-based scenarios alone. This significantly improves the understanding of actual judgment and decision-making behavior of industry managers and consumers.

Unfortunately, while we had hoped to feature some novel experiments along these lines as part of this special issue, they were not submitted for consideration. While one might take this as an indication that the field is not interested in this method, we believe this would be an erroneous conclusion. Looking at just the topic of inventory decision-making alone, Perera *et al.* (2020) show that the number of experiments published has increased significantly over the last 20 years. Instead, we believe that the lack of field experiments or immersive vignette submissions reflects the time and difficulty required to arrange and execute one. This is one of the drawbacks of the experimental methodology. While some can be exceedingly fast and simple to design and carry out, they exponentially increase in complexity with each factor added, and the challenge of conducting one in industry vs a student or online sample is similarly difficult.

In our own observation, one experimental method that would be novel in the SCM field yet less challenging to execute is the mixed design experiment. Mixed designs combine both between-subjects and within-subjects factors. While mixed designs are common in other fields, such as psychology and medical research, to the best of our knowledge, one has yet to be published in a SCM research study. Mixed designs allow researchers to address certain research questions with greater statistical power than a between-subjects design alone. This results from the ability to control for individual-level differences. For example, suppose a researcher was interested in examining the effects of augmented reality technology on the productivity of warehouse order pickers over vs under the age of forty. A mixed design would allow for the technology intervention to be administered to all participants (as opposed to half in a between-subjects design). Productivity in a simulated warehouse picking

task could be recorded pre and post-intervention (making it a within-subject factor), and participant age (>40 vs <40) could be treated as a between-subjects factor. Doing so would control for many individual-level differences among pickers, such as skill, spatial awareness, or physical condition that could all inflate error variance in a between-subjects design. As another example, one may be interested in the effectiveness of a training intervention designed to combat a particular cognitive bias in replenishment managers' order quantity or timing. Individuals' performance in an inventory management task could be measured both pre and post-intervention (within subjects), while the demand variance of the product being managed (high, medium, low) could serve as a between-subjects factor.

Mixed designs are also helpful for longitudinal or repeated measures studies where researchers are interested in examining effects over time. Considering the replenishment manager example above, one may be interested in the duration of the impact of various training interventions. After verifying the initial effectiveness of multiple interventions, participants could be randomly assigned to one type (between-subjects) and the quality of their performance could be measured over time (within-subjects). As another example, one may be interested in the role individual buyer agents' personality types have on supplier relationship satisfaction after the buying organization implements a major requirement, such as cybersecurity or traceability. The current type of relationship between the buyer and supplier (transactional vs collaborative vs alliance), the type of initiative, and the buying agent's personality type (e.g. Big 5 or Myers-Briggs) could serve as between-subjects factors in a laboratory experiment designed to simulate this decision scenario. In contrast, suppliers' satisfaction could be measured several times over a given time span (within-subject).

Additionally, increasing the realism and generalizability of experiments is essential. This can be achieved by employing mediated models, considering teams rather than individuals as the units of analysis, and incorporating participants from non-WEIRD (Western, Educated, Industrialized, Rich, and Democratic) populations (Carter *et al.*, 2024). These approaches will enhance the relevance and applicability of SCM research, providing deeper insights that are critical for both academic and practical advancements.

In short, while no experiments are included in this special issue, we expect to continue seeing many published in the SCM literature more broadly in the coming years. When designing future work, we encourage researchers to consider some of the novel approaches highlighted here.

In the call for papers, we were particularly interested in papers within SCM that demonstrate methodological advancements using qualitative comparative analysis, explorative design science, and experimental approaches. However, some questions related to these approaches remain underexplored. Next, we have highlighted unanswered questions for each method that, when addressed, could significantly advance research methodology in SCM (Table 1).

New venues for future research on methodological innovation in SCM

Starting from assessing the methodological approaches within SCM studies that emerged from screening articles published by leading SCM journals in the last five years (see Appendix), some interesting methodological advances and overlooked methods arise. In this section, we provide a commentary on the overlooked methodological advancements and discuss the most prominent ones for future research.

For example, using archival data can significantly transform SCM research by enabling the exploration of new questions and expanding the range of research topics (Miller *et al.*, 2021; Ellinger *et al.*, 2020). This transformation is driven by the increased availability of data and tools, which offer fresh perspectives on research inquiries and broaden our understanding of the field (Miller *et al.*, 2021). While archival data in SCM offers extensive

Research methods and approaches	Research questions to be considered and potential venues for future research
QCA	• How can QCA be used to develop and refine theories in SCM by identifying and analyzing complex configurations of factors that lead to successful and unsuccessful outcomes? • How can QCA be effectively integrated with longitudinal study designs to track and understand the evolution of strategic configurations over time in SCM? • What methodological innovations are required to improve the integration of QCA with qualitative data, specifically interviews, to enhance the granularity and context-specific insights in SCM research? • In what ways can SCM researchers employ QCA to explore pathways to success and systematically understand the configurations that lead to failures in supply chain strategies?
Design science	• How can CIMO-design logic be combined with different methodological approaches in SCM to build on existing knowledge more effectively and identify new contributions to the literature? • How can explorative design science research be developed as a methodology for setting theoretically novel and practically relevant research agendas? • What methodological approaches are available for SCM researchers to facilitate engagement and implementation in the field? • What methods and methodological approaches can we develop to identify the unexpected?
Experimental design	• How can SCM researchers develop research questions and leverage practitioner relationships to successfully identify opportunities for field experiments? • What are the methodological implications and outcomes of incorporating advanced technological tools, such as virtual reality, in SCM experimental settings to increase ecological validity? • What role can mixed design experiments play in advancing SCM research, particularly in addressing complex, multi-factorial issues and longitudinal considerations?

Source(s): Table by authors'

Table 1. Research questions for more advances in research methodologies for supply chain management

opportunities, researchers must be wary of challenges like data fit, accuracy, and representativeness and actively seek solutions to ensure robust research design and credible results (Culot *et al.*, 2023) Additionally, concerns have emerged regarding the ability to interact effectively with the community (Murphy and Schlaerth, 2010). Attention is also increasingly being dedicated to field or natural experiments (e.g. Wallenburg *et al.*, 2021; Son *et al.*, 2023), where collaboration with companies is a key driver for researchers. This collaboration provides a fertile context for future data collection and enhances their studies' relevance and managerial implications.

We also see an interesting opportunity in how machine learning transforms SCM by prioritizing predictive capabilities over-optimization. This shift towards prediction enables the detection of surprising outcomes within complex patterns, enhancing managerial relevance and prompting a significant move towards more inductive, theory-generating research methods in the field (Handfield *et al.*, 2019). Moreover, adopting machine learning as a research method within scientific inquiries marks a significant advancement in artificial intelligence applications. This approach is anticipated to enhance research quality but raises several concerns simultaneously. Consequently, a more thorough discussion on the benefits and limitations of machine learning in research is necessary to understand its implications and address potential issues effectively (Lindebaum and Fleming, 2024; Burger *et al.*, 2023).

Another overlooked opportunity is model-free evidence, an empirical analysis used to identify correlations between variables or patterns in the dataset. Through visualization and tabulation, it elucidates data variability and relationships, thereby enhancing credibility and support. This sets the stage for further statistical analysis to assess the significance and magnitude of theoretical claims in research (i.e. Scott and Davis-Sramek, 2023). This combination validates theoretical claims and controls for confounders, particularly in SCM research, providing a robust framework for understanding changes over time or the impact of events (Davis-Sramek *et al.*, 2023).

Predictive modeling is essential in SCM, playing a crucial role in practical decision-making and strategy formulation. By emphasizing models' predictive capabilities, researchers increase the practical relevance of their findings. This shift addresses a critical gap where the previous focus was more on explanatory than predictive modeling. Although explanation is vital for clarifying causal mechanisms in supply chain research, focusing exclusively on this aspect without incorporating prediction can compromise understanding underlying dynamics (Cheah *et al.*, 2023).

Recently, Marin-Garcia *et al.* (2023) made a novel contribution by identifying that no existing models propose a Triple-A capability implementation sequence with superior predictive capability for enhancing performance and competitive advantage. Therefore, integrating explanation with prediction is paramount to advancing insights in SCM and improving business practices.

Simulation with real data, as demonstrated in a recent study by Mendonça *et al.* (2024), enhances the accuracy and relevance of models in logistics and operations management. This supports informed decision-making, optimizes processes, and facilitates cost-effective innovation testing—which is essential for improving responsiveness and efficiency in rapidly evolving supply chain conditions. However, despite its widespread application, we caution that the primary objective of such simulations should be to contribute to theoretical advancements. We recommend adhering to recent guidelines by Melnyk *et al.* (2023) for conducting simulation research that advances theoretical understanding and ensures relevance and significance.

Replication studies in SCM, such as "Exact Replication," "Methods-Only Replication," "Bounded-Conceptual-Extension," and "Transformative Replications" (Polyviou *et al.*, 2024; Pagell, 2021), play a critical role in refining theoretical perspectives, confirming previous results, and providing new insights. This systematic approach to replication promotes continuous improvement, robust scientific progress, and a more precise understanding of SCM phenomena.

Finally, diverse qualitative research approaches enrich our understanding of complex, ambiguous, and multi-level supply chain issues (Wieland *et al.*, 2024). Methods like interpretative research, sense-making, ethnography, and narrative research offer valuable perspectives on industry problems. Exploratory research can unveil valuable insights into new contexts, advancing our knowledge in theory-based and boundary-expanding ways. Integrating abundant quantitative and secondary data across the supply chain enhances the potential for inductive insights and discoveries, potentially leading to new theories rooted in supply chain knowledge (Stank *et al.*, 2024; Russo and Wong, 2024). These varied qualitative methods show no one-size-fits-all solution to supply chain challenges, as strategies differ across firms and societies. Using these approaches fosters theory development, aids in exploring uncharted areas, enhances stakeholder interactions, and facilitates the implementation of relevant and rigorous practices.

Conclusions

In conclusion, embracing methodological diversity and innovation is essential for advancing supply chain research. By exploring and integrating a range of advanced research

methodologies, we can address current gaps and pave the way for future discoveries. This special issue serves as a call to action for scholars to adopt and develop innovative methodologies, ensuring that the field continues to evolve and respond effectively to emerging challenges. Through such efforts, we can achieve a deeper and more nuanced understanding of supply chain dynamics, benefiting both academia and practice.

In the dynamic realm of SCM, methodological innovation responds to evolving research challenges. It fundamentally transforms our approach as a scholars to exploring complex phenomena, enhancing our ability to forge new theoretical insights and address practical challenges with greater precision and relevance (Banks and Aguinis, 2023).

Methodological innovation, including new analytical approaches and research designs, enables scholars to revisit old questions and explore new territories (Frankel *et al.*, 2005; Kotzab *et al.*, 2006; Goldsby and Zinn, 2018; Bergh *et al.*, 2022). Thus, methodological evolution elevates research standards (rigor) and enables scholars to innovate theory and tackle practically relevant questions (relevance).

Furthermore, methodological advancements empower scholars to pursue new and complex inquiries about the behaviors and performance of individuals, groups, and organizations (Bergh *et al.*, 2022). Effective methodologies should match the research problem's maturity. By employing a combination of deductive and inductive approaches (Bliese *et al.*, 2024), we enhance middle-range theorizing and foster more robust, dynamic, and insightful academic inquiries (Craighead *et al.*, 2024).

During an LSCM conference in 2024, one of the Guest Editors participated in an insightful discussion among scholars who proposed using the technique of backcasting (Robinson, 2003) to outline pathways for future research and theory development in logistics and SCM. By assuming future states—such as solving the climate change challenge, addressing artificial intelligence impacts, and redesigning global supply chains—we can draft the steps needed to achieve these scenarios, in our case, the most suitable methodological advance and the need to achieve certain desired end-points and answers.

While guidelines for making theoretical contributions are well-established (Ketchen *et al.*, 2022), more guidance is needed on making methodological contributions. This gap has been underscored in this special issue's aim to highlight and disseminate innovative methodological approaches to meet the evolving challenges of supply chain problems. By expanding methodological diversity, we can enhance the field's capacity to tackle more complex and varied research questions, ultimately contributing to the body of knowledge with robust and applicable findings.

References

Aken, J.E.V. (2004), "Management research based on the paradigm of the design sciences: the quest for field-tested and grounded technological rules", *Journal of Management Studies*, Vol. 41 No. 2, pp. 219-246, doi: 10.1111/j.1467-6486.2004.00430.x.

Arellano, M.C., Meuer, J. and Netland, T.H. (2021), "Commitment follows beliefs: a configurational perspective on operations managers' commitment to practice adoption", *Journal of Operations Management*, Vol. 67 No. 4, pp. 450-475, doi: 10.1002/joom.1130.

Arthur, W.B. (2009), "Complexity and the economy", in *Handbook of Research on Complexity*, Edward Elgar Publishing.

Banks, G.C. and Aguinis, H. (2023), "Improving management theory and policy-making through innovative methods and data", *Academy of Management Perspectives*, Vol. 37 No. 4, pp. 335-350, doi: 10.5465/amp.2022.0099.

Bergh, D.D., Boyd, B.K., Byron, K., Gove, S. and Ketchen, D.J. Jr (2022), "What constitutes a methodological contribution?", *Journal of Management*, Vol. 48 No. 7, pp. 1835-1848, doi: 10.1177/01492063221088235.

Bliese, P.D., Certo, S.T., Smith, A.D., Wang, M. and Gruber, M. (2024), "Strengthening theory–methods–data links", *Academy of Management Journal*, Vol. 67 No. 4, pp. 893-902.

Burger, B., Kanbach, D.K., Kraus, S., Breier, M. and Corvello, V. (2023), "On the use of AI-based tools like ChatGPT to support management research", *European Journal of Innovation Management*, Vol. 26 No. 7, pp. 233-241, doi: 10.1108/ejim-02-2023-0156.

Carter, C.R., Meschnig, G. and Kaufmann, L. (2015), "Moving to the next level: why our discipline needs more multi-level theorization", *Journal of Supply Chain Management*, Vol. 51 No. 4, pp. 94-102, doi: 10.1111/jscm.12083.

Carter, C.R., Rockwood, R.F., Patel, P.C., Bachrach, D., Bendoly, E., DuHadway, S. and Kaufmann, L. (2024), "Experiments in supply chain management research: a systematic review and future directions", *Journal of Business Logistics*, Vol. 45 No. 3, e12382, doi: 10.1111/jbl.12382.

Chandrasekaran, A., de Treville, S. and Browning, T.R. (2020), "Editorial: intervention-based research (IBR)—what, where, and how to use it in operations management", *Journal of Operations Management*, Vol. 66 No. 4, pp. 370-378, doi: 10.1002/joom.1093.

Cheah, J.H., Kersten, W., Ringle, C.M. and Wallenburg, C. (2023), "Guest editorial: predictive modeling in logistics and supply chain management research using partial least squares structural equation modeling", *International Journal of Physical Distribution and Logistics Management*, Vol. 53 Nos 7/8, pp. 709-717, doi: 10.1108/ijpdlm-08-2023-552.

Coughlan, P. and Coghlan, D. (2002), "Action research for operations management", *International Journal of Operations and Production Management*, Vol. 22 No. 2, pp. 220-240, doi: 10.1108/01443570210417515.

Craighead, C.W., Ketchen, D.J. Jr and Cheng, L. (2016), "'Goldilocks' theorizing in supply chain research: balancing scientific and practical utility via middle-range theory", *Transportation Journal*, Vol. 55 No. 3, pp. 241-257, doi: 10.5325/transportationj.55.3.0241.

Craighead, C.W., Cheng, L. and Ketchen, D.J. Jr (2024), "Using middle-range theorizing to advance supply chain management research: a how-to primer and demonstration", *Journal of Business Logistics*, Vol. 45 No. 3, doi: 10.1111/jbl.12381.

Culot, G., Podrecca, M., Nassimbeni, G., Orzes, G. and Sartor, M. (2023), "Using supply chain databases in academic research: a methodological critique", *Journal of Supply Chain Management*, Vol. 59 No. 1, pp. 3-25, doi: 10.1111/jscm.12294.

Darby, J.L., Fugate, B.S. and Murray, J.B. (2019), "Interpretive research: a complementary approach to seeking knowledge in supply chain management", *International Journal of Logistics Management*, Vol. 30 No. 2, pp. 395-413, doi: 10.1108/ijlm-07-2018-0187.

Davis-Sramek, B., Scott, A. and Richey, R.G. Jr (2023), "A case and framework for expanding the use of model-free evidence", *Journal of Business Logistics*, Vol. 44 No. 1, pp. 4-10, doi: 10.1111/jbl.12330.

Denyer, D., Tranfield, D. and Van Aken, J.E. (2008), "Developing design propositions through research synthesis", *Organization Studies*, Vol. 29 No. 3, pp. 393-413, doi: 10.1177/0170840607088020.

Eckerd, S., DuHadway, S., Bendoly, E., Carter, C.R. and Kaufmann, L. (2021), "On making experimental design choices: discussions on the use and challenges of demand effects, incentives, deception, samples, and vignettes", *Journal of Operations Management*, Vol. 67 No. 2, pp. 261-275, doi: 10.1002/joom.1128.

Ellinger, A.E., Adams, F.G., Franke, G.R., Herrin, G.D., deCoster, T.E. and Filips, K.E. (2020), "A triadic longitudinal assessment of multiple supply chain participants' performance and the extended enterprise concept", *International Journal of Physical Distribution and Logistics Management*, Vol. 50 Nos 7/8, pp. 745-767, doi: 10.1108/ijpdlm-07-2019-0209.

Flygansvær, B., Samuelsen, A.G. and Støyle, R.V. (2021), "The power of nudging: how adaptations in reverse logistics systems can improve end-consumer recycling behavior", *International Journal of Physical Distribution and Logistics Management*, Vol. 51 No. 9, pp. 958-977.

Franke, H., Chae, S. and Foerstl, K. (2024), "Toward a configurational understanding of global supply chain complexity", *Journal of Business Logistics*, Vol. 45 No. 2, e12371, doi: 10.1111/jbl.12371.

Frankel, R., Naslund, D. and Bolumole, Y. (2005), "The 'white space' of logistics research: a look at the role of methods usage", *Journal of Business Logistics*, Vol. 26 No. 2, pp. 185-209, doi: 10.1002/j.2158-1592.2005.tb00211.x.

Gauss, L., Lacerda, D.P. and Romme, A.G.L. (2024), "Mechanisms as boundary objects for connecting design with science in operations management research", *Operations Management Research*, Vol. 17 No. 1, pp. 291-306, doi: 10.1007/s12063-023-00431-7.

Glaesser, J. (2023), "Limited diversity and QCA solution types: assumptions and their consequences", *Quality and Quantity*, Vol. 57 No. 4, pp. 3485-3497, doi: 10.1007/s11135-022-01483-w.

Gligor, D., Feizabadi, J., Russo, I., Maloni, M.J. and Goldsby, T.J. (2020), "The triple-a supply chain and strategic resources: developing competitive advantage", *International Journal of Physical Distribution and Logistics Management*, Vol. 50 No. 2, pp. 159-190, doi: 10.1108/ijpdlm-08-2019-0258.

Gligor, D., Russo, I. and Maloni, M.J. (2022), "Understanding gender differences in logistics innovation: a complexity theory perspective", *International Journal of Production Economics*, Vol. 246, 108420, doi: 10.1016/j.ijpe.2022.108420.

Goldsby, T.J. and Zinn, W. (2018), "Methods to our madness: adapting methods to the changing nature of our problems", *Journal of Business Logistics*, Vol. 39 No. 4, pp. 234-241, doi: 10.1111/jbl.12200.

Groop, J., Ketokivi, M., Gupta, M. and Holmström, J. (2017), "Improving home care: knowledge creation through engagement and design", *Journal of Operations Management*, Vol. 53 No. 1, pp. 9-22, doi: 10.1016/j.jom.2017.11.001.

Gupta, M., Harshal, L., Chandrashekhar, C. and Groop, J. (2024), "Combining design logic and thinking processes to manage spare parts distribution", *International Journal of Physical Distribution and Logistics Management*, Nos 7-8.

Haesebrouck, T. (2023), "Relevant, irrelevant, or ambiguous? Toward a new interpretation of QCA's solution types", *Sociological Methods and Research*, Vol. 52 No. 4, pp. 1737-1764, doi: 10.1177/00491241211036153.

Handfield, R., Jeong, S. and Choi, T. (2019), "Emerging procurement technology: data analytics and cognitive analytics", *International Journal of Physical Distribution and Logistics Management*, Vol. 49 No. 10, pp. 972-1002, doi: 10.1108/ijpdlm-11-2017-0348.

Hasle, P. and Vang, J. (2021), "Designing better interventions: insights from research on decent work", *Journal of Supply Chain Management*, Vol. 57 No. 2, pp. 58-70, doi: 10.1111/jscm.12261.

Henfridsson, O. and Bygstad, B. (2013), "The generative mechanisms of digital infrastructure evolution", *MIS Quarterly*, Vol. 37 No. 3, pp. 907-931, doi: 10.25300/misq/2013/37.3.11.

Holmström, J. and Romme, A.G.L. (2012), "Guest editorial: five steps towards exploring the future of operations management", *Operations Management Research*, Vol. 5 Nos 1-2, pp. 37-42, doi: 10.1007/s12063-011-0060-8.

Holmström, J., Ketokivi, M. and Hameri, A.P. (2009), "Bridging practice and theory: a design science approach", *Decision Sciences*, Vol. 40 No. 1, pp. 65-87, doi: 10.1111/j.1540-5915.2008.00221.x.

Kaufmann, L. and Gaeckler, J. (2015), "A structured review of partial least squares in supply chain management research", *Journal of Purchasing and Supply Management*, Vol. 21 No. 4, pp. 259-272, doi: 10.1016/j.pursup.2015.04.005.

Ketchen Jr, D.J., Kaufmann, L. and Carter, C.R. (2022), "Configurational approaches to theory development in supply chain management: leveraging underexplored opportunities", *Journal of Supply Chain Management*, Vol. 58 No. 3, pp. 71-88, doi: 10.1111/jscm.12275.

Kotzab, H., Seuring, S., Müller, M. and Reiner, G. (Eds) (2006), *Research Methodologies in Supply Chain Management*, Springer Science & Business Media.

Kozinets, R. (2019), *Netnography: The Essential Guide to Qualitative Social Media Research*, Sage, London.

Lindebaum, D. and Fleming, P. (2024), "ChatGPT undermines human reflexivity, scientific responsibility and responsible management research", *British Journal of Management*, Vol. 35 No. 2, pp. 566-575, doi: 10.1111/1467-8551.12781.

Lonati, S., Quiroga, B.F., Zehnder, C. and Antonakis, J. (2018), "On doing relevant and rigorous experiments: review and recommendations", *Journal of Operations Management*, Vol. 64 No. 1, pp. 19-40, doi: 10.1016/j.jom.2018.10.003.

Ma, T., Cheng, Y., Guan, Z., Li, B., Hou, F. and Lim, E.T.K. (2024), "Theorising moderation in the configurational approach: a guide for identifying and interpreting moderating influences in QCA", *Information Systems Journal*, Vol. 34 No. 3, pp. 762-787, doi: 10.1111/isj.12439.

Malik, M. and Ali, I. (2024), "Towards a critical realism synthesis of configurational and middle-range theorising", *International Journal of Physical Distribution and Logistics Management*, Vol. ahead-of-print No. ahead-of-print, doi: 10.1108/IJPDLM-05-2023-0185.

Marin-Garcia, J.A., Machuca, J.A. and Alfalla-Luque, R. (2023), "In search of a suitable way to deploy Triple-A capabilities through assessment of AAA models' competitive advantage predictive capacity", *International Journal of Physical Distribution and Logistics Management*, Vol. 53 Nos 7/8, pp. 860-885, doi: 10.1108/ijpdlm-03-2022-0091.

Martins, R., Siegler, J., Freitas, J.S., Santos, L.F.M.D., Barroso, M.B.C. and Macedo, R.D.C. (2024), "Repertory grid technique and Honey's content analysis: a methodological application to advance qualitative research in OSCM", *International Journal of Physical Distribution and Logistics Management*, Nos 7-8, doi: 10.1108/ijpdlm-01-2023-0054.

Melnyk, S.A., Thürer, M., Blome, C., Schoenherr, T. and Gold, S. (2023), "(Re)-discovering simulation as a critical element of OM/SCM research: call for research", *International Journal of Operations and Production Management*, Vol. 44 No. 7, pp. 1376-1389, doi: 10.1108/ijopm-08-2023-0665.

Mendonça, G.D., Oliveira, S.R.D.M., Lima, O.F. Jr and Resende, P.T.V.D. (2024), "Intelligent algorithms applied to the prediction of air freight transportation delays", *International Journal of Physical Distribution and Logistics Management*, Vol. 54 No. 1, pp. 61-91, doi: 10.1108/ijpdlm-10-2022-0328.

Miller, J., Davis-Sramek, B., Fugate, B.S., Pagell, M. and Flynn, B.B. (2021), "Editorial commentary: addressing confusion in the diffusion of archival data research", *Journal of Supply Chain Management*, Vol. 57 No. 3, pp. 130-146, doi: 10.1111/jscm.12236.

Murphy, J.W. and Schlaerth, C.A. (2010), "Where are your data? A critique of secondary data analysis in sociological research", *Humanity and Society*, Vol. 34 No. 4, pp. 379-390, doi: 10.1177/016059761003400405.

Näslund, D. (2002), "Logistics needs qualitative research–especially action research", *International Journal of Physical Distribution and Logistics Management*, Vol. 32 No. 5, pp. 321-338, doi: 10.1108/09600030210434143.

Nikookar, E., Gligor, D. and Russo, I. (2024), "Supply chain resilience: when the recipe is more important than the ingredients for managing supply chain disruptions", *International Journal of Production Economics*, Vol. 272 No. June 2024, 109236, doi: 10.1016/j.ijpe.2024.109236.

Öhman, M., Hiltunen, M., Virtanen, K. and Holmström, J. (2021), "Frontlog scheduling in aircraft line maintenance: from explorative solution design to theoretical insight into buffer management", *Journal of Operations Management*, Vol. 67 No. 2, pp. 120-151, doi: 10.1002/joom.1108.

Oliva, R. (2019), "Intervention as a research strategy", *Journal of Operations Management*, Vol. 65 No. 7, pp. 710-724, doi: 10.1002/joom.1065.

Pagell, M. (2021), "Replication without repeating ourselves: addressing the replication crisis in operations and supply chain management research", *Journal of Operations Management*, Vol. 67 No. 1, pp. 105-115, doi: 10.1002/joom.1120.

Pawson, R. and Tilley, N. (1997), "An introduction to scientific realist evaluation", *Evaluation for the 21st century: A handbook*, Vol. 1997, pp. 405-418, doi: 10.4135/9781483348896.n29.

Peng, D.X. and Lai, F. (2012), "Using partial least squares in operations management research: a practical guideline and summary of past research", *Journal of Operations Management*, Vol. 30 No. 6, pp. 467-480, doi: 10.1016/j.jom.2012.06.002.

Perera, H.N., Fahimnia, B. and Tokar, T. (2020), "Inventory and ordering decisions: a systematic review on research driven through behavioral experiments", *International Journal of Operations and Production Management*, Vol. 40 Nos 7/8, pp. 997-1039, doi: 10.1108/ijopm-05-2019-0339.

Polyviou, M., Rungtusanatham, J., Reczek, R.W., Dooley, K. and Knemeyer, A.M. (2024), "Advancing OSCM scientific knowledge by replicating empirical findings: step-by-step procedure and illustration for transformative replication endeavors", *Decision Sciences*, Vol. 55 No. 2, pp. 111-136, doi: 10.1111/deci.12623.

Risberg, A., Jafari, H. and Sandberg, E. (2023), "A configurational approach to last mile logistics practices and omni-channel firm characteristics for competitive advantage: a fuzzy-set qualitative comparative analysis", *International Journal of Physical Distribution and Logistics Management*, Vol. 53 No. 11, pp. 53-70.

Robinson, J. (2003), "Future subjunctive: backcasting as social learning", *Futures*, Vol. 35 No. 8, pp. 839-856, doi: 10.1016/s0016-3287(03)00039-9.

Russo, I. and Wong, C.Y. (2024), "Navigating excellence: understanding and overcoming common causes of manuscript rejections in logistics and supply chain management research", *International Journal of Physical Distribution and Logistics Management*, Vol. 54 No. 2, pp. 211-228, doi: 10.1108/ijpdlm-03-2024-554.

Russo, I., Confente, I., Gligor, D. and Cobelli, N. (2019), "A roadmap for applying qualitative comparative analysis in supply chain research: the reverse supply chain case", *International Journal of Physical Distribution and Logistics Management*, Vol. 49 No. 1, pp. 99-120, doi: 10.1108/ijpdlm-02-2018-0056.

Rynarzewska, A.I. and Giunipero, L. (2024), "Netnography: a research method to study supply chain members' interactions in online communities", *International Journal of Physical Distribution and Logistics Management*, Vol. ahead-of-print No. ahead-of-print, doi: 10.1108/IJPDLM-05-2023-0193.

Sarstedt, M., Adler, S.J., Ringle, C.M., Cho, G., Diamantopoulos, A., Hwang, H. and Liengaard, B.D. (2024), "Same model, same data, but different outcomes: evaluating the impact of method choices in structural equation modeling", *Journal of Product Innovation Management*. doi: 10.1111/jpim.12738.

Scott, A. and Davis-Sramek, B. (2023), "Driving in a man's world: examining gender disparity in the trucking industry", *International Journal of Physical Distribution and Logistics Management*, Vol. 53 No. 3, pp. 330-353, doi: 10.1108/ijpdlm-03-2022-0073.

Sein, M.K., Henfridsson, O., Purao, S., Rossi, M. and Lindgren, R. (2011), "Action design research", *MIS Quarterly*, Vol. 35 No. 1, pp. 37-56, doi: 10.2307/23043488.

Shepherd, B. and Sriklay, T. (2023), "Extending and understanding: an application of machine learning to the World Bank's logistics performance index", *International Journal of Physical Distribution and Logistics Management*, Vol. 53 No. 9, pp. 985-1014.

Simon, H.A. (2019), *The Sciences of the Artificial, Reissue of the Third Edition with a New Introduction by John Laird*, MIT Press, Cambridge.

Son, Y., Choi, A.A., Wowak, K.D. and Angst, C.M. (2023), "Gender mismatch and bias in people-centric operations: evidence from a randomized field experiment", *Journal of Operations Management*, Vol. 70 No. 5, pp. 686-711, doi: 10.1002/joom.1299.

Stank, T., Saunders, L.W., Scott, A., Autry, C.W. and Esper, T.L. (2024), "'Theory will take you only so far' (Nolan, 2023): in search of greater insight through quantitative, observation-based research", *Journal of Business Logistics*, Vol. 45 No. 3, e12383, doi: 10.1111/jbl.12383.

Stark, A., Ferm, K., Hanson, R., Johansson, M., Khajavi, S., Medbo, L., Öhman, M. and Holmström, J. (2023), "Hybrid digital manufacturing: capturing the value of digitalization", *Journal of Operations Management*, Vol. 69 No. 6, pp. 890-910, doi: 10.1002/joom.1231.

Svanberg, M. (2020), "Guidelines for establishing practical relevance in logistics and supply chain management research", *International Journal of Physical Distribution and Logistics Management*, Vol. 50 No. 2, pp. 215-232, doi: 10.1108/ijpdlm-11-2018-0373.

Tanskanen, K., Holmström, J. and Öhman, M. (2015), "Generative mechanisms of the adoption of logistics innovation: the case of on-site shops in construction supply chains", *Journal of Business Logistics*, Vol. 36 No. 2, pp. 139-159, doi: 10.1111/jbl.12089.

van Hoek, R., Lacity, M. and Willcocks, L. (2022), "Influencing supply chain practice: the action principles approach applied to pandemic risk management", *International Journal of Physical Distribution and Logistics Management*, Vol. 52 No. 5/6, pp. 456-478.

Vishkaei, B.M. and De Giovanni, P. (2024), "Bayesian Network methodology and machine learning approach: an application on the impact of digital technologies on logistics service quality", *International Journal of Physical Distribution and Logistics Management*, Vol. ahead-of-print No. ahead-of-print.

Wallenburg, C.M., Einmahl, L., Lee, K.B. and Rao, S. (2021), "On packaging and product returns in online retail—mailing boxes or sending signals?", *Journal of Business Logistics*, Vol. 42 No. 2, pp. 291-308, doi: 10.1111/jbl.12273.

Wang, S., Cheah, J.-H., Wong, C.Y. and Ramayah, T. (2023), "Progress in partial least squares structural equation modeling use in logistics and supply chain management in the last decade: a structured literature review", *International Journal of Physical Distribution and Logistics Management*, Vol. ahead-of-print No. ahead-of-print, doi: 10.1108/IJPDLM-06-2023-0200.

Wieland, A., Tate, W.L. and Yan, T. (2024), "A guided tour through the qualitative research", *Journal of Supply Chain Management*, Vol. 60 No. 1, pp. 3-12, doi: 10.1111/jscm.12315.

Woelfl, K., Kaufmann, L. and Carter, C.R. (2023), "In the eye of the beholder: a configurational exploration of perceived deceptive supplier behavior in negotiations", *Journal of Supply Chain Management*, Vol. 59 No. 2, pp. 33-61, doi: 10.1111/jscm.12298.

Wong, C.Y. (2021), "Celebrating IJPDLM's 50th anniversary: a reflection on its contributions and future directions", *International Journal of Physical Distribution and Logistics Management*, Vol. 51 No. 10, pp. 1049-1064, doi: 10.1108/ijpdlm-10-2021-0427.

Appendix

Overview of previous methodological approaches in LSCM research

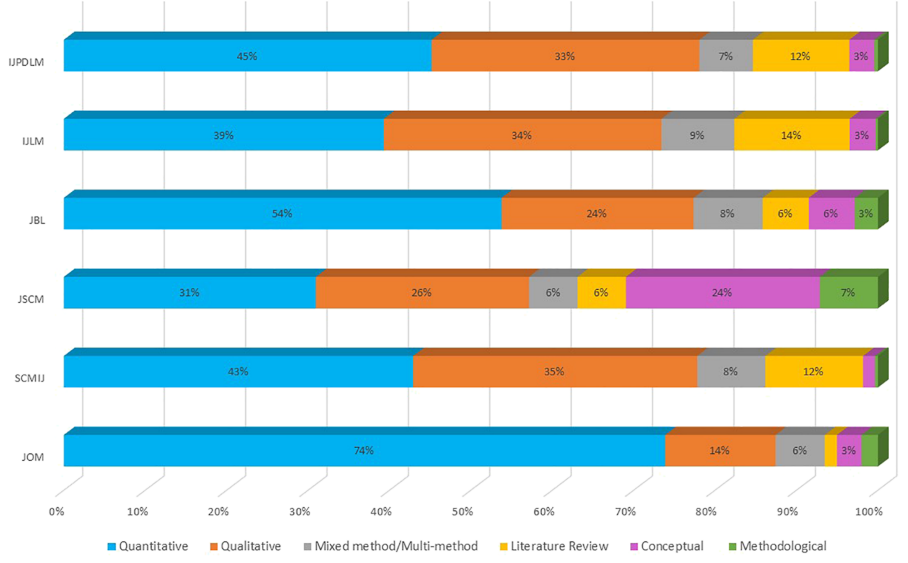
To provide an overview of the methodological approaches used, we conducted a descriptive analysis of manuscripts published between 2019 and 2023 in six prominent journals in the field. This period encompassed five years of research in SCM, spanning from 2019 to 2023, and is recognized as a significant duration for encapsulating the domain's current state. The selected journals, listed in alphabetical order are (1) The International Journal of Logistics Management (IJLM), (2) International Journal of Physical Distribution and Logistics Management (IJPDLM), (3) Journal of Business Logistics (JBL), (4) Journal of Operations Management (JOM) (5) Journal of Supply Chain Management (JSCM), and (6) Supply Chain Management: An International Journal (SCMIJ). We acknowledge the inherent subjectivity in our selection of journals, which may omit other publications that concentrate on distinct aspects of SCM, including production and purchasing.

The search was broad with no keyword restriction to identify all the published papers but bounded in time to capture the contributions of the last five years, i.e. 2019–2023. We searched in the Scopus database for all the articles published in the selected journals. An abstract screening and a full-text screening have been conducted for every article to identify the general research method utilized in the article (i.e. qualitative, quantitative, conceptual, etc.), the method for data collection (i.e. survey, interview, secondary data, etc.), and the approach for data analysis (i.e. statistical analysis, coding, etc.).

Figure A1 represents the main methodological approaches the six leading journals adopted in the last five years.

During these five years, for example, IJPDLM published 228 research articles, where we excluded Editorials authored by EIC and guest editors for special issues. Figure A1 shows the percentage of methods used by articles published in 2019–2023. The journal publishes primarily quantitative studies (45%) and qualitative studies (33%). Literature reviews are utilized less frequently, accounting for only 12% of methodologies, marking a decline from previous assessments (Wong, 2021). These earlier assessments emphasized the need to focus on conceptual and theoretical development through literature reviews rather than merely tallying citations or topics studied. There are also few conceptual articles (3%) and studies using mixed methods (7%).

While case studies, interviews, and surveys remain the most common methods for data collection in the Journal, quantitative structural equation modeling (SEM) and regression analysis are frequently used for data analysis. Recently, qualitative comparative analysis (Risberg *et al.*, 2023) and action research (e.g. van Hoek *et al.*, 2022) have also been applied within the SCM domain. Employing diverse methodologies and data sources is particularly beneficial in design science or action research, where the goal is to generate outcomes that advance both practical applications and theoretical development. It is important to emphasize the value of these studies, especially in response to the increasing demand for a more robust integration between theory and practice. Among the quantitative studies, 15% are based on experiments, but field experiments are conducted only on a very limited basis, with only a few examples (Flygansvær *et al.*, 2021). New analytical approaches, such as machine learning, are also emerging, with recent studies analyzing secondary data (e.g. Shepherd and Sriklay, 2023; Mendonça *et al.*, 2024).



Source(s): Figure by authors

Figure A1. Overview of methodologies (2019–2023)

Concerning the other journals involved in the research, the proportion of articles adopting a quantitative methodology varies depending on the aim and nature of each journal, reaching almost 75% for JOM or being limited to less than one-third of the articles published in JSCM. Contrarily, qualitative studies are well-represented in each of the leading journals, with the only exception being JOM where they constitute only 14% of the total articles published, ranging from 24% to 35% in each journal. Mixed-method and methodological papers fall below the 10% threshold in each journal, while conceptual papers are on the rise, particularly for JSCM where they account for 24% of the published papers.

Corresponding author
Ivan Russo can be contacted at: ivan.russo@univr.it