

A Case Study on Consumer Behavior, Supply Chain Sustainability and Logistics Localization

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ABSTRACT

Sustainability has become a defining concern in contemporary logistics and supply chain management, particularly as omnichannel retailing expands product returns and intensifies packaging use. This comparative case study examines how sustainable logistics outcomes are shaped through the interaction of consumer behavior and organizational localization strategies by integrating empirical evidence from two distinct contexts, young consumers' packaging and return behavior in Poland and supply chain localization practices implemented by Blue Dart Express Ltd. across multiple regions in India.

Using a mixed-methods research design, the study draws on quantitative survey data collected from 446 Polish consumers aged 18-25 and 70 respondents representing customers and operational stakeholders within Blue Dart's logistics network. Findings from the Polish context reveal persistent inefficiencies in packaging utilization and a notable gap between consumers' expressed environmental concern and their actual return behavior in omnichannel retail systems. Although respondents reported strong preferences for sustainable packaging materials, frequent returns and cross-channel return practices substantially increased material waste and reverse logistics complexity, echoing concerns raised in prior sustainability research (Hadaś et al., 2024).

In contrast, the Indian case demonstrates that technology-enabled supply chain localization can significantly enhance operational efficiency and service quality in a heterogeneous market environment. Respondents highlighted real-time tracking, region-specific service customization, and industry-focused logistics solutions as critical contributors to improved reliability and customer satisfaction, supporting the argument that localization functions as a strategic capability rather than a purely operational adjustment (Roy, 2024).

By integrating consumer-level behavioral insights with firm-level operational evidence, this study contributes to logistics and supply chain literature by illustrating that sustainability and efficiency are not inherently competing objectives. Instead, sustainable outcomes are more likely when packaging design, consumer engagement, digital technologies, and regionally responsive logistics strategies are aligned. The findings offer practical and theoretical insights for logistics providers and policymakers seeking to design resilient, efficient, and environmentally responsible supply chain systems.

Keywords: Sustainable logistics, Omnichannel retailing; Packaging efficiency; Reverse logistics; Supply chain localization; Logistics technology

INTRODUCTION

The rapid transformation of global commerce over the past decade has fundamentally reshaped logistics and supply chain management. The expansion of e-commerce and omnichannel retailing has enhanced consumer convenience and market accessibility, yet it has simultaneously intensified challenges related to packaging waste, reverse logistics, and environmental sustainability. Consequently, logistics systems are no longer evaluated solely on speed and cost efficiency; their capacity to operate sustainably while adapting to diverse regional and institutional conditions has become a central performance criterion (Gunasekaran et al., 2015).

Sustainability in logistics increasingly represents a multidimensional challenge that extends beyond technological upgrades or infrastructural investment. Rather, it reflects the complex interaction between consumer decision-making, packaging design practices, and organizational capabilities to structure and localize logistics operations. Young consumers play a particularly influential role in this dynamic. As digitally fluent and environmentally aware participants in the marketplace, they frequently articulate strong preferences for sustainable products and environmentally friendly packaging. However, prior research indicates that such stated preferences often coexist with behaviors—such as frequent product returns and channel switching—that significantly increase transportation intensity and material waste within omnichannel systems (Hadaś et al., 2024; Lim et al., 2018).

At the organizational level, logistics service providers operating across geographically diverse and heterogeneous markets face parallel pressures to balance sustainability objectives with operational effectiveness. Supply chain localization has emerged as a strategic response to these pressures, enabling firms to adapt logistics networks, service offerings, and delivery configurations to region-specific infrastructure, customer expectations, and industry requirements. When supported by digital technologies such as real-time tracking and data-driven coordination, localization allows firms to reconcile standardized processes with contextual customization, thereby enhancing both efficiency and service reliability (Roy, 2024). This perspective aligns with broader supply chain literature that emphasizes the role of dynamic capabilities in managing complexity and improving performance across distributed networks (Guide & Van Wassenhove, 2009).

This comparative case study brings together two independent yet thematically aligned research investigations to examine how sustainability objectives and operational effectiveness are pursued within contemporary logistics systems. The first study focuses on young consumers in Poland and explores how packaging choices and return behaviors shape environmental outcomes in omnichannel retailing. The second study examines supply chain localization strategies implemented by Blue Dart Express Ltd. across multiple regions in India, with particular emphasis on the role of technology integration and service customization in operational performance.

By integrating consumer-side behavioral evidence with firm-level operational insights, the study demonstrates that sustainability challenges in logistics are not solely technical or infrastructural in nature. Instead, they emerge from the dynamic interaction between consumer behavior, packaging utilization, and organizational adaptability. The findings reveal substantial packaging inefficiencies and a pronounced gap between stated environmental concern and actual consumer behavior in the Polish context, alongside strong evidence that technology-enabled localization enhances efficiency and service quality in the Indian logistics environment (Hadaś et al., 2024; Roy, 2024).

Through its cross-national and multi-level perspective, this study contributes to the sustainable logistics literature by offering empirically grounded insights relevant to global logistics providers, e-commerce platforms, and policymakers. It underscores the need for integrated strategies that align consumer engagement, packaging innovation, and localized logistics capabilities in order to reconcile environmental responsibility with service excellence in increasingly complex supply networks.

LITERATURE REVIEW AND RESEARCH GAP

Sustainability and Logistics in Omnichannel Systems

Sustainability has become a central theme in logistics and supply chain research as firms confront rising environmental pressures alongside increasing operational complexity. The growth of e-commerce and omnichannel retailing has intensified these challenges by expanding delivery options, accelerating reverse logistics, and increasing packaging material usage. Scholars widely agree that logistics sustainability extends beyond emissions reduction to include material efficiency, waste minimization, and long-term system resilience (Gunasekaran et al., 2015). Packaging design and return management have therefore emerged as critical focal points in the sustainability discourse.

Within omnichannel environments, reverse logistics represents a particularly complex sustainability challenge. Flexible return policies enhance customer satisfaction but significantly increase transportation intensity and

material waste. Prior research highlights that return rates in online retail can exceed those in traditional channels by several multiples, thereby amplifying the environmental footprint of logistics operations (Lim et al., 2018). As a result, scholars have increasingly examined how packaging efficiency and return behavior influence sustainability outcomes across supply chains.

Consumer Behavior, Packaging, and the Sustainability Paradox

A growing body of literature emphasizes the role of consumers in shaping logistics sustainability outcomes. Studies consistently report that consumers express strong environmental concern and preference for recyclable or eco-friendly packaging materials. However, this stated awareness frequently fails to translate into environmentally responsible behavior, particularly in the context of online shopping and product returns. This phenomenon has been described as a sustainability or attitude–behavior gap, where environmental values coexist with consumption practices that generate significant waste (Hadaś et al., 2024).

Research focusing on packaging in omnichannel returns demonstrates persistent inefficiencies in capacity utilization, excessive use of materials, and limited reuse of packaging during reverse flows. Hadaś et al. (2024) show that even environmentally conscious young consumers often treat returns as a low-risk trial mechanism, prioritizing convenience over environmental impact. Such findings suggest that sustainability challenges in logistics cannot be addressed solely through material innovation or packaging redesign without considering behavioral drivers and incentives embedded in omnichannel systems.

Despite these insights, much of the consumer-focused literature remains concentrated on attitudinal analysis and descriptive statistics. While these studies effectively identify inefficiencies and behavioral contradictions, they often stop short of connecting consumer behavior to firm-level operational strategies that could mitigate such impacts. Consequently, the role of logistics providers in shaping or moderating consumer-driven sustainability outcomes remains underexplored.

Supply Chain Localization and Organizational Capabilities

Parallel to consumer-oriented research, logistics and supply chain literature has increasingly examined localization as a strategic response to market heterogeneity and operational complexity. Supply chain localization refers to the adaptation of logistics networks, services, and processes to region-specific conditions such as infrastructure quality, regulatory environments, customer expectations, and industry requirements. Rather than undermining efficiency, localization is increasingly viewed as a dynamic capability that enhances responsiveness and resilience when supported by digital technologies (Guide & Van Wassenhove, 2009).

Empirical studies indicate that technology-enabled localization—particularly real-time tracking, data integration, and customized service offerings—can improve operational performance and customer satisfaction in diverse market contexts. Roy (2024) demonstrates that localized logistics solutions in the Indian market, when combined with digital infrastructure, enhance service reliability and operational efficiency across sectors such as e-commerce, healthcare, and manufacturing. These findings align with broader supply chain research emphasizing the strategic value of technology in coordinating complex and geographically dispersed operations.

However, organizational-level studies on localization often prioritize efficiency, service quality, and competitive advantage, with limited attention to environmental outcomes or consumer behavior. Sustainability is frequently treated as an implicit benefit rather than an explicit analytical dimension. As a result, the potential of localization strategies to address sustainability challenges arising from consumer-driven behaviors—such as frequent returns and inefficient packaging use—remains insufficiently examined.

Integrated Perspectives and Literature Gap

Although substantial progress has been made in understanding sustainability challenges in logistics, existing research exhibits a notable fragmentation. Consumer-focused studies emphasize environmental attitudes and behavioral contradictions but rarely engage with organizational capabilities or operational design. Conversely, firm-level and localization-focused studies highlight efficiency and customization while often overlooking the role of consumer behavior in shaping sustainability outcomes.

This separation limits the ability to develop holistic and actionable insights into sustainable logistics systems. There is a clear gap in the literature for integrative, multi-level research that simultaneously examines consumer behavior, packaging practices, and organizational localization strategies across different geographic contexts. Moreover, comparative cross-national studies remain relatively scarce, particularly those that juxtapose consumer-driven sustainability challenges in developed markets with technology-enabled operational responses in emerging economies.

Addressing this gap, the present study adopts a comparative case study approach that integrates consumer-side evidence from Poland with firm-level operational insights from India. By bridging behavioral and organizational perspectives, the study responds to calls for more context-sensitive and system-oriented research in sustainable logistics. In doing so, it contributes to the literature by demonstrating how sustainability and operational effectiveness can be jointly pursued through the strategic alignment of consumer engagement, packaging efficiency, and localized, technology-driven logistics systems.

RESEARCH DESIGN AND METHODOLOGY

This study adopts a comparative case study design supported by mixed research methods to examine sustainability and operational effectiveness in contemporary logistics systems across different geographic and institutional contexts. A comparative approach is particularly appropriate where the research objective is not statistical generalization but analytical insight into how similar challenges manifest differently across settings. By integrating quantitative survey evidence with descriptive and interpretive analysis, the study enables a systematic comparison between consumer-driven sustainability dynamics and firm-level operational strategies.

Quantitative survey data constitute the empirical foundation of both cases, ensuring consistency in data structure while allowing for contextual adaptation. This design supports cross-context comparison by identifying convergent and divergent patterns in logistics practices, consumer behavior, and operational outcomes. The use of mixed methods further strengthens internal validity by combining numerical evidence with interpretive reasoning, which is essential for understanding complex sustainability phenomena in logistics systems.

Geographic Scope

The study covers two distinct empirical contexts. The first case focuses on Poland and adopts a national-level perspective centered on young consumers aged 18–25. This demographic group is particularly relevant due to its high engagement with e-commerce platforms, familiarity with omnichannel retailing, and pronounced environmental awareness. Examining this segment allows for deeper insight into how sustainability attitudes translate into packaging use and return behavior within online retail systems.

The second case is situated in India and examines supply chain localization practices within Blue Dart Express Ltd., a leading logistics service provider. The Indian study adopts a multi-regional scope, covering operations across South, North, East, West, and Central India. This geographic diversity captures variations in infrastructure quality, customer expectations, and industry composition, thereby providing a robust basis for analyzing localization strategies in a heterogeneous market environment.

Data Collection

Data collection methods were tailored to the objectives and contexts of each case while maintaining methodological consistency. The Polish study employed a Computer-Assisted Web Interview (CAWI) survey administered between December 2022 and May 2023. This method enabled efficient data collection from a geographically dispersed population and ensured standardized question delivery. The survey captured consumer perceptions of packaging, delivery options, return behavior, and environmental attitudes within omnichannel retailing.

The Indian study utilized structured questionnaires with Likert-scale items administered to Blue Dart customers and operational stakeholders. Respondents reflected on their experiences with localized logistics solutions, technology integration, and service performance over an approximate three-year interaction period. This

approach allowed respondents to assess operational effectiveness based on sustained engagement rather than isolated transactions, thereby enhancing the depth of insight into localization outcomes.

Analytical Techniques

Data analysis combined quantitative rigor with interpretive synthesis. For the Polish dataset, descriptive statistics, frequency distributions, and contingency analysis were used to examine packaging utilization, return behavior, and delivery preferences. These techniques facilitated the identification of patterns and relationships across categorical variables. For the Indian dataset, Likert-scale responses were aggregated to assess perceived effectiveness of localization strategies, complemented by thematic interpretation to contextualize quantitative trends.

Finally, findings from both cases were synthesized through comparative analysis to identify shared challenges, contextual differences, and strategic implications. This integrative analytical process enabled the study to move beyond isolated case insights and develop a coherent understanding of how sustainability and operational effectiveness intersect across consumer and organizational dimensions of logistics systems.

Validity and Reliability

Ensuring the validity and reliability of findings was a central consideration in the research design. Construct validity was strengthened through the use of measurement items grounded in established logistics and sustainability literature. Survey instruments in both studies were carefully aligned with the research objectives, capturing key constructs such as packaging efficiency, return behavior, service localization, and technology-enabled logistics performance. The use of clearly defined variables and consistent measurement scales enhanced conceptual clarity and minimized ambiguity in respondent interpretation.

Internal validity was addressed through the comparative case study design, which enabled pattern matching across two distinct empirical contexts. By examining both consumer-side behavior and firm-level operational practices, the study reduced the risk of single-source bias and supported more robust explanatory insights. The integration of descriptive statistics with interpretive analysis further strengthened internal coherence by allowing quantitative trends to be contextualized within broader operational and behavioral frameworks.

Reliability was supported through standardized data collection procedures. In the Polish study, the Computer-Assisted Web Interview (CAWI) method ensured uniform question delivery and minimized interviewer influence. The relatively large sample size enhanced consistency and stability of observed patterns. In the Indian study, structured questionnaires with Likert-scale items were employed to promote response consistency across respondents and regions. While the organizational case study approach prioritizes depth over generalizability, the use of clearly structured instruments and repeated exposure to services over time contributed to the dependability of responses.

External Validity

External validity in this study is achieved through analytical rather than statistical generalization. The Polish case offers insights relevant to omnichannel retail environments in developed markets with high e-commerce penetration, while the Indian case provides transferable lessons for logistics providers operating in heterogeneous and infrastructure-diverse contexts. The comparative design enhances external relevance by demonstrating how similar sustainability challenges manifest differently across consumer-driven and organization-driven settings. Readers are thus able to assess the applicability of findings to comparable logistics environments.

Ethical Considerations

Ethical principles were observed throughout all stages of the research process. Participation in both studies was voluntary, and respondents were informed of the purpose of the research prior to data collection. In the Polish study, respondents' anonymity was preserved, and no personally identifiable information was collected. Data were used solely for academic research purposes.

In the Indian study, respondents associated with Blue Dart were assured confidentiality, and responses were aggregated to prevent identification of individual participants or operational units. Care was taken to avoid the disclosure of commercially sensitive information. Data storage and handling followed standard academic protocols to ensure security and integrity.

Overall, the research adhered to ethical norms of transparency, informed consent, confidentiality, and responsible data use. These considerations enhance the credibility of the findings and support the integrity of the comparative analysis.

Sample Composition and Justification

The Polish sample comprised 446 respondents, exceeding the statistically required minimum of 385 calculated at a 95% confidence level. This enhanced the robustness of subgroup analysis across product categories, delivery methods, and return behaviors. The Indian sample of 70 respondents reflects a purposive organizational case study approach, prioritizing contextual depth and regional diversity over population-level generalization.

Key Findings: Polish Consumer Study

The findings from the Polish consumer study reveal systematic inefficiencies in packaging utilization within omnichannel retail logistics, highlighting important sustainability challenges at the intersection of consumer behavior and operational design. Nearly half of all surveyed shipments were filled below 80% of their packaging capacity, and more than half contained no internal filling material. These results indicate a structural mismatch between product dimensions and packaging choices, leading to unnecessary material consumption and inefficient space utilization during transportation. Such inefficiencies contribute directly to increased environmental impact through higher material use and reduced transport efficiency, reinforcing concerns raised in prior research on sustainable packaging practices in e-commerce logistics (Hadaś et al., 2024).

Despite these inefficiencies, respondents expressed a strong preference for environmentally friendly packaging solutions, particularly cardboard and recyclable materials. Many also reported a willingness to pay a premium for sustainable packaging alternatives. This apparent alignment between consumer attitudes and sustainability objectives, however, contrasts sharply with observed behavioral patterns. A substantial proportion of respondents engaged in frequent product returns, often treating online purchases as low-risk trials rather than final transactions. This behavior significantly increases reverse logistics activity, amplifies transportation emissions, and undermines the environmental benefits of using recyclable packaging materials. These findings underscore the persistence of an attitude-behavior gap in sustainable consumption, a phenomenon widely documented across sustainability and logistics literature (Lim et al., 2018).

The omnichannel context further intensifies this paradox. Consumers in the study reported extensive access to multiple delivery and return options, including home delivery, parcel lockers, and collection points. While this diversity of channels enhances convenience and consumer autonomy, it also increases system complexity and environmental burden. Most respondents returned products using the original packaging, suggesting a preference for consistency and ease in the return process. However, cross-channel return behavior—where products are returned through a different channel than the original delivery—was widespread. Such practices disrupt logistical optimization, as packaging and transport systems are typically designed for specific channel configurations. Consequently, cross-channel returns contribute to inefficiencies in routing, consolidation, and capacity utilization.

From a sustainability perspective, these findings indicate that consumer choice, while valuable from a service standpoint, can inadvertently exacerbate environmental impact when not aligned with system-level efficiency goals. Prior research has emphasized that omnichannel logistics often externalizes environmental costs to the supply chain, particularly when consumers prioritize convenience over sustainability considerations (Gunasekaran et al., 2015). The present study reinforces this argument by demonstrating how even environmentally conscious consumers may contribute to unsustainable outcomes through routine behavioral practices.

The Polish study also reveals important implications for packaging policy and logistics design. The prevalence of under-filled packages suggests opportunities for packaging standardization, modular design, and improved product-to-package matching. While consumers may prefer recyclable materials, material choice alone is insufficient to ensure sustainability if packaging volume and utilization remain inefficient. This aligns with closed-loop supply chain research, which emphasizes the need to integrate packaging design with reverse logistics planning to reduce waste and improve overall system efficiency (Guide & Van Wassenhove, 2009).

Importantly, the findings suggest that sustainability interventions in logistics must extend beyond material innovation to include behavioral and informational mechanisms. Consumer education, return incentives, and choice architecture can play a critical role in moderating return behavior and encouraging more sustainable consumption patterns. Without such interventions, improvements in packaging materials risk being offset by increased return volumes and transport intensity.

In summary, the Polish consumer study highlights a clear disconnect between environmental attitudes and actual consumption behavior within omnichannel retail systems. While consumers express strong support for sustainable packaging, their frequent use of returns and cross-channel options generates significant inefficiencies that undermine environmental objectives. These results demonstrate that achieving sustainable logistics outcomes requires coordinated efforts that align consumer behavior, packaging design, and logistics system architecture. Addressing sustainability in isolation-whether through consumer awareness campaigns or packaging material substitution-will be insufficient without a holistic approach that accounts for the behavioral realities of omnichannel consumption.

key findings: blue dart india study

The findings from the Indian case study provide strong evidence that supply chain localization, when supported by technology integration, plays a critical role in enhancing operational performance and customer satisfaction within complex and heterogeneous market environments. A majority of respondents perceived Blue Dart's logistics services as well adapted to regional needs, indicating that localized service design effectively addresses variations in infrastructure quality, delivery expectations, and industry-specific requirements across different regions of India. This perception of contextual alignment reflects the strategic value of localization as an organizational capability rather than a purely operational adjustment.

One of the most salient findings concerns the role of digital technology in enabling effective localization. Realtime tracking emerged as the most valued technological feature among respondents, reinforcing transparency, reliability, and predictability in logistics operations. Visibility across the shipment lifecycle reduces information asymmetry between service providers and customers, thereby strengthening trust and improving coordination. Prior logistics research emphasizes that digital visibility tools are essential for managing uncertainty and complexity in distributed supply chains, particularly in markets characterized by geographic dispersion and infrastructural variability (Gunasekaran et al., 2015). The present findings support this view by demonstrating that real-time tracking not only enhances customer experience but also contributes to internal operational efficiency.

Respondents also reported tangible operational improvements resulting from localized logistics solutions, particularly in sectors such as e-commerce, healthcare, and manufacturing. In the e-commerce sector, localized routing and region-specific delivery models improved last-mile efficiency and reduced delivery lead times. In healthcare logistics, customization enabled better handling of time-sensitive and temperature-controlled shipments, enhancing service reliability and compliance with regulatory requirements. Manufacturing clients benefited from improved synchronization between inbound and outbound logistics, reducing disruptions and inventory-related inefficiencies. These sector-specific outcomes highlight how localization allows logistics providers to align operational design with the unique performance demands of different industries.

The dominance of domestic express services in overall service usage further underscores the strategic importance of internal market optimization. In the Indian context, where regional diversity in consumer behavior, infrastructure, and regulatory frameworks is pronounced, focusing on domestic express capabilities enables firms to capture scale advantages while remaining responsive to local conditions. This finding aligns with supply chain research that emphasizes the importance of tailoring service portfolios to dominant demand patterns rather than

pursuing uniform global standardization (Guide & Van Wassenhove, 2009). By prioritizing domestic express services, Blue Dart demonstrates a strategic alignment between market demand and operational capability.

From a theoretical perspective, the findings contribute to the growing literature on supply chain localization and dynamic capabilities. Localization in this case functions as an adaptive mechanism that allows the organization to reconfigure resources, processes, and technologies in response to environmental complexity. Digital tools such as real-time tracking act as enablers of this adaptability by providing timely information and facilitating coordination across regions. This supports the argument that technology-enabled localization can simultaneously enhance efficiency, resilience, and service quality in logistics systems (Roy, 2024).

Importantly, the Indian study also complements consumer-focused sustainability research by illustrating how organizational strategies can mitigate inefficiencies inherent in logistics systems. While consumer-driven behaviors often increase operational complexity, as seen in omnichannel retail contexts, firm-level investments in localization and technology can partially offset these pressures. By improving routing efficiency, service reliability, and operational visibility, localized logistics solutions contribute indirectly to sustainability objectives through reduced delays, better asset utilization, and lower operational waste.

Overall, the Indian case study demonstrates that supply chain localization, supported by robust digital infrastructure, is a critical determinant of logistics performance in emerging market contexts. The findings highlight that effective localization enhances not only customer satisfaction but also internal operational outcomes across multiple sectors. These insights reinforce the need for logistics providers to view localization and technology integration as strategic imperatives rather than optional enhancements. When aligned with market structure and demand patterns, such strategies enable firms to achieve operational excellence while navigating the complexity of diverse regional environments.

COMPARATIVE ANALYSIS AND DISCUSSION

The comparative analysis of the Polish and Indian case studies reveals that sustainability challenges in logistics manifest in fundamentally different ways depending on whether system dynamics are primarily consumer-driven or organization-driven. While both contexts operate within increasingly complex logistics environments shaped by e-commerce growth and service expectations, the sources of inefficiency, as well as the levers for improvement, vary significantly. These differences underscore the importance of adopting context-sensitive strategies rather than uniform sustainability solutions across markets.

In the Polish context, sustainability challenges are largely rooted in consumer behavior and packaging design decisions embedded within omnichannel retail systems. Despite high levels of environmental awareness and expressed preference for sustainable packaging materials, consumer practices—such as frequent product returns and cross-channel return behavior—generate substantial inefficiencies. Packaging is often underutilized, transport capacity is wasted, and reverse logistics activity intensifies. These outcomes reflect a behavioral paradox in which consumers' environmental intentions are undermined by convenience-driven decisionmaking. Prior research has consistently highlighted this attitude–behavior gap, particularly in digital consumption environments where return policies reduce perceived risk and weaken accountability for environmental consequences (Hadaś et al., 2024; Lim et al., 2018).

In contrast, the Indian case illustrates how sustainability-relevant performance gains are achieved primarily through organizational investment in supply chain localization and digital infrastructure. Rather than being driven by consumer return behavior, operational effectiveness in the Indian context depends on the firm's ability to manage geographic diversity, infrastructural variation, and sector-specific requirements. Localization strategies—supported by real-time tracking, region-specific routing, and customized service offerings—enable Blue Dart to improve efficiency, reliability, and customer satisfaction across multiple regions. These findings align with supply chain literature that positions localization as a dynamic capability allowing firms to adapt to environmental complexity without sacrificing operational coherence (Guide & Van Wassenhove, 2009).

The contrast between the two cases highlights an important theoretical insight: sustainability challenges are not universally driven by the same mechanisms. In consumer-centric omnichannel systems, inefficiencies often

emerge from micro-level behavioral patterns that accumulate into system-level environmental impact. In organization-centric logistics networks, particularly in emerging markets, sustainability-relevant improvements are more closely linked to macro-level strategic choices regarding infrastructure, technology, and service design. This distinction suggests that sustainability interventions must be targeted at the dominant drivers within each context rather than applied uniformly.

Across both cases, technology emerges as a critical bridging mechanism that connects sustainability objectives with operational performance. However, the role of technology differs depending on its point of application. In the Indian case, backend digital systems-such as real-time tracking and data-driven coordination-enable efficient localization, enhance visibility, and reduce uncertainty across geographically dispersed operations. These technologies support better resource utilization, improved routing decisions, and stronger coordination between actors, thereby contributing indirectly to sustainability through operational efficiency (Gunasekaran et al., 2015).

In the Polish context, technology operates more visibly at the consumer interface, shaping usage patterns and expectations. Omnichannel platforms provide consumers with extensive choice and flexibility, but they also lower the friction associated with returns and channel switching. While such technologies enhance customer experience, they can inadvertently encourage behaviors that increase environmental burden. This comparison highlights a critical asymmetry: the same technological advancement can either mitigate or exacerbate sustainability challenges depending on how it interacts with human behavior and system incentives.

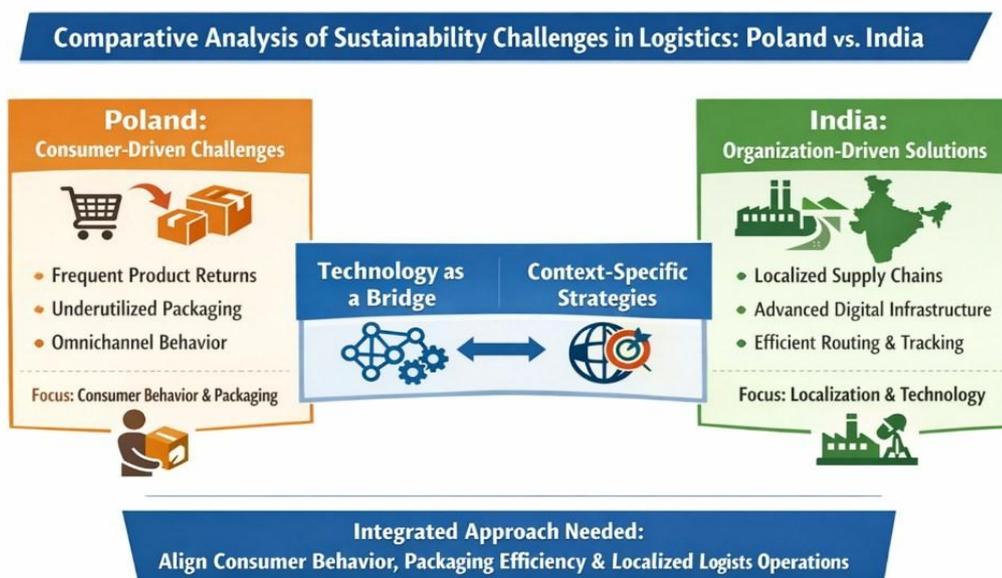


Fig. 1

The comparative findings therefore reinforce the argument that sustainability outcomes in logistics depend on the alignment of three interdependent elements: consumer behavior, packaging innovation, and localized operational strategies. Packaging innovation alone-such as shifting to recyclable materials-offers limited environmental benefit if packaging volume remains inefficient and return rates remain high. Similarly, organizational investments in localization and digital infrastructure can improve efficiency, but their sustainability impact may be constrained if consumer-driven behaviors continue to generate excessive reverse logistics activity.

From a managerial perspective, the comparison suggests that logistics providers must adopt differentiated sustainability strategies. In consumer-driven contexts such as Poland, interventions should focus on behavioral mechanisms, including return policies, choice architecture, and consumer education. Nudging consumers toward fewer returns, incentivizing consolidated returns, or linking convenience options to environmental impact information may help bridge the sustainability gap identified in the study. In organization-driven contexts such as India, continued investment in localization and digital infrastructure appears essential for sustaining operational excellence and indirectly supporting environmental objectives through efficiency gains.

The comparative analysis also contributes to theory by bridging micro-level and macro-level perspectives in sustainable logistics research. Much of the existing literature treats consumer behavior and organizational strategy as separate analytical domains. The present study demonstrates that these domains are deeply interconnected and must be examined together to fully understand sustainability outcomes. By juxtaposing consumer-driven inefficiencies with organization-driven efficiencies, the study offers a more integrated conceptualization of sustainable logistics systems that accounts for both behavioral and structural determinants.

Finally, the cross-national design of the study highlights the importance of contextual sensitivity in sustainability research. Developed markets with mature e-commerce ecosystems face sustainability challenges that differ fundamentally from those in emerging markets characterized by infrastructural diversity and rapid growth. Comparative research of this nature is therefore essential for advancing theory and informing practice in global logistics. Rather than seeking universal solutions, scholars and practitioners must recognize that sustainable logistics outcomes emerge from context-specific alignments between technology, behavior, and organizational capability.

In summary, the comparative analysis demonstrates that sustainability challenges in logistics are multifaceted and context-dependent. In Poland, inefficiencies arise primarily from consumer behavior and packaging design within omnichannel systems, while in India, performance gains stem from deliberate organizational investments in localization and digital infrastructure. Technology functions as a critical connector across both contexts, but its sustainability impact depends on how it shapes behavior and operations. These findings underscore the need for integrated, context-aware strategies that align consumer engagement, packaging efficiency, and localized logistics design to achieve sustainable and resilient supply chain systems.

Managerial And Policy Implications

The findings of this comparative case study offer several important practical and policy-oriented implications for stakeholders seeking to advance sustainability and operational effectiveness in contemporary logistics systems. A central implication is that sustainable logistics cannot be achieved through isolated or symbolic initiatives. Instead, it requires coordinated, system-level interventions that integrate packaging optimization, consumer behavior management, technological investment, and supportive regulatory frameworks.

For logistics providers and e-commerce platforms, packaging optimization should be treated as a core operational and strategic priority. The evidence from the Polish consumer study highlights that inefficient packaging utilization—such as under-filled packages and unnecessary material use—significantly increases environmental impact, even when recyclable materials are employed. Firms should therefore adopt data-driven packaging strategies that emphasize modular design, standardized package sizes, and improved product-topackage matching. Integrating packaging design with reverse logistics planning is particularly important, as packaging efficiency directly affects transportation intensity, handling costs, and waste generation (Guide & Van Wassenhove, 2009). Such integration allows logistics providers to reduce both environmental footprint and operational inefficiencies simultaneously.

Behavioral interventions represent a second critical lever for improving sustainability outcomes. The study demonstrates that environmental awareness alone does not reliably translate into sustainable consumer behavior, especially in omnichannel retail environments characterized by high convenience and low perceived return costs. Logistics firms and retailers can address this gap through behavioral nudges and incentive-based mechanisms designed to moderate unnecessary return behavior. Examples include offering incentives for consolidated returns, providing feedback on the environmental impact of return choices, or differentiating service levels based on sustainability performance. Prior research suggests that such choice architecture interventions can influence consumer decision-making without undermining service quality (Lim et al., 2018). When aligned with operational goals, behavioral interventions can reduce reverse logistics volumes and improve overall system efficiency.

Investments in region-specific infrastructure and digital systems constitute a third major implication, particularly for logistics providers operating in geographically diverse markets. The Indian case illustrates that technology-enabled localization—such as real-time tracking, regionally optimized routing, and customized service offerings—enhances both operational performance and customer satisfaction. Digital visibility tools reduce uncertainty,

improve coordination, and enable better utilization of assets, thereby contributing indirectly to sustainability through efficiency gains (Gunasekaran et al., 2015). Importantly, these technologies are most effective when deployed in ways that reflect regional infrastructure conditions, customer expectations, and industry requirements, rather than through uniform, one-size-fits-all solutions.

From an organizational perspective, the findings suggest that sustainability and efficiency should be pursued as complementary objectives rather than competing priorities. Packaging optimization, reverse logistics coordination, and digital investment function as interconnected strategic levers. Improvements in one area can amplify benefits in others when managed holistically. Conversely, neglecting any one dimension risks offsetting gains achieved elsewhere. Logistics managers should therefore adopt integrated performance metrics that capture environmental impact, operational efficiency, and service quality simultaneously, enabling more informed decision-making.

The study also carries important implications for policymakers and regulatory bodies. Public policy can play a crucial role in creating enabling conditions for sustainable logistics by establishing standards and frameworks that encourage circular economy practices. Packaging efficiency standards, incentives for reusable or returnable packaging systems, and guidelines for reverse logistics coordination can support firms in aligning sustainability objectives with operational feasibility. Policymakers can also promote transparency by encouraging standardized reporting on packaging utilization, return rates, and logistics-related emissions, thereby fostering accountability across supply chains.



Fig. 2

Collaboration between public and private actors is particularly important in this context. Logistics providers, retailers, packaging suppliers, and regulators must work together to develop shared standards and infrastructure that support sustainable practices without compromising service accessibility. Such collaboration aligns with broader green supply chain literature emphasizing the role of coordinated incentives and partnerships in achieving sustainability outcomes (Gunasekaran et al., 2015).

Finally, for researchers and educators, the study underscores the value of applied, comparative research in informing both practice and policy. By highlighting how sustainability challenges differ across consumer-driven and organization-driven contexts, the findings caution against universal policy prescriptions and instead advocate for context-sensitive interventions. Future policy and managerial initiatives should therefore be grounded in empirical evidence that accounts for behavioral, technological, and organizational dimensions of logistics systems.

In sum, the practical and policy implications of this study emphasize that sustainable logistics outcomes require integrated action across firms, consumers, and institutions. Packaging optimization, behavioral interventions, localized digital infrastructure, and supportive policy frameworks must be aligned to reduce environmental impact while maintaining operational resilience. Such alignment is essential for designing logistics systems capable of meeting the dual demands of sustainability and performance in an increasingly complex global economy.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Despite offering rich comparative insights, this study is subject to certain limitations that should be acknowledged. First, the Polish consumer study relies on self-reported survey data, which may be influenced by social desirability bias, particularly in responses related to environmental attitudes. While the large sample size strengthens statistical reliability, actual behavior may deviate further from stated preferences in real-world contexts. Second, the Blue Dart study adopts an organizational case study approach with a relatively small sample size, which limits statistical generalization beyond the specific firm and regions studied. However, this limitation is consistent with the exploratory and depth-oriented objectives of case-based logistics research.

Future research could extend this comparative framework by incorporating longitudinal behavioral data, experimental interventions aimed at reducing returns, or multi-firm comparisons across different logistics providers. Additionally, integrating carbon footprint measurement and life-cycle assessment of packaging materials would provide a more precise estimation of environmental impact. Expanding the geographic scope to include additional emerging and developed markets would further enhance the external validity of the findings.

Theoretical Contributions

This study contributes to logistics and supply chain management theory in three important ways. First, it advances understanding of the sustainability-behavior gap by empirically demonstrating how consumer environmental awareness does not automatically translate into environmentally responsible logistics outcomes. Second, it enriches localization theory by showing how technology-enabled customization operates as a dynamic capability that enhances both efficiency and service quality. Third, by integrating consumer-side and firm-side perspectives, the study bridges micro-level behavioral research and macro-level operational strategy, offering a more holistic conceptualization of sustainable logistics systems.

Practical Implications

The findings of this comparative case study offer several important practical implications for logistics practitioners, supply chain managers, and policymakers seeking to advance sustainability while maintaining operational effectiveness. One of the central insights is the need to move beyond symbolic or surface-level sustainability initiatives toward solutions that are embedded within day-to-day logistics operations.

Sustainability efforts that focus solely on visible actions, such as the use of recyclable packaging materials, are unlikely to deliver meaningful environmental benefits if they are not aligned with operational design, consumer behavior, and system-level efficiency.

For logistics firms, packaging optimization should be treated as a strategic priority rather than a technical afterthought. The evidence from the Polish case highlights that inefficient packaging utilization—such as underfilled packages and excessive material use—can negate the environmental advantages of recyclable materials. Firms should therefore invest in data-driven packaging design, modular packaging systems, and improved product-to-package matching to reduce unused capacity and material waste. Integrating packaging decisions with reverse logistics planning is particularly important, as packaging efficiency directly influences transportation intensity and return handling costs (Guide & Van Wassenhove, 2009).

Reverse logistics coordination represents a second critical area for managerial action. Liberal return policies enhance customer satisfaction but also generate significant environmental and operational costs when not properly managed. Logistics providers and e-commerce platforms should collaborate to design return systems that balance convenience with sustainability. This may include incentivizing consolidated returns, encouraging the use of designated return channels, or providing transparent information on the environmental impact of return choices. Such behavioral interventions can complement operational improvements by moderating consumer-driven inefficiencies identified in omnichannel systems (Lim et al., 2018).

Technology investment emerges as a third interconnected strategic lever. The Indian case demonstrates that digital tools, particularly real-time tracking and data integration systems, enhance both operational performance and customer trust. For practitioners, this implies that technology should be viewed not merely as an efficiency-enhancing tool but as an enabler of sustainability-oriented coordination across supply chain actors. Improved visibility allows firms to optimize routing, reduce delays, and improve asset utilization, all of which contribute indirectly to lower environmental impact (Gunasekaran et al., 2015). Importantly, technology investments should be aligned with localization strategies to ensure that digital solutions are responsive to regional conditions rather than imposed uniformly.

From a broader industry perspective, the findings suggest that sustainability in logistics requires coordinated action across organizational boundaries. Collaboration between logistics providers, e-commerce platforms, packaging suppliers, and policymakers is essential for developing standards and incentives that promote sustainable practices without undermining service quality. Policymakers can support such collaboration by encouraging circular economy initiatives, setting packaging efficiency standards, and promoting transparency in environmental reporting.

For scholars, the study underscores the value of comparative, cross-national research designs in uncovering contextual nuances that single-country studies may overlook. By juxtaposing consumer-driven sustainability challenges in a developed market with organization-driven operational strategies in an emerging economy, the research demonstrates how sustainability outcomes are shaped by context-specific interactions between behavior, technology, and organizational capability. Such designs are particularly well suited to Scopus-indexed journals that emphasize theoretical contribution, methodological rigor, and international relevance. Future research building on this approach can further inform both academic debate and managerial practice in sustainable logistics.

CONCLUSION

This comparative case study set out to examine how sustainability and operational effectiveness are addressed within contemporary logistics systems through the combined lenses of consumer behavior and supply chain localization. By integrating empirical evidence from two distinct contexts—young consumers engaged in omnichannel retailing in Poland and a logistics service provider operating across multiple regions in India—the study demonstrates that sustainable logistics outcomes emerge from the interaction of consumer choices, packaging practices, technological infrastructure, and localized operational strategies rather than from isolated interventions.

The findings from the Polish consumer study highlight that environmental consciousness alone is insufficient to ensure sustainable logistics outcomes. Although consumers expressed strong preferences for environmentally friendly packaging and demonstrated awareness of sustainability issues, their frequent use of product returns and flexible omnichannel options generated significant inefficiencies. Underutilized packaging, increased

transportation intensity, and complex reverse logistics flows collectively undermined the environmental benefits of recyclable materials. These results reinforce existing research that identifies a persistent gap between environmental attitudes and actual consumption behavior, particularly in digital retail environments where convenience and risk reduction dominate decision-making (Hadaś et al., 2024; Lim et al., 2018).

In contrast, the Indian case study of Blue Dart Express Ltd. illustrates how deliberate organizational investment in technology and regional customization can generate measurable improvements in both operational performance and customer satisfaction. Localization strategies, supported by digital infrastructure such as real-time tracking and data-driven coordination, enabled the firm to adapt its services to diverse regional and sectoral requirements. These investments improved visibility, reliability, and efficiency across logistics operations, demonstrating that technology-enabled localization functions as a strategic capability rather than a peripheral enhancement (Roy, 2024). Importantly, the Indian case shows that efficiency gains achieved through operational design can also support sustainability objectives indirectly by improving resource utilization and reducing operational waste (Gunasekaran et al., 2015).

Taken together, the comparative findings reinforce the argument that sustainability and efficiency are not competing objectives but complementary outcomes when strategically aligned. The study underscores that sustainable logistics cannot be achieved solely through consumer awareness campaigns or material substitution in packaging. Instead, it requires coordinated alignment across multiple dimensions, including consumer engagement mechanisms, packaging innovation, digital infrastructure, and regionally responsive operational strategies. Failure to address any one of these dimensions' risks offsetting gains achieved in others.

Beyond its empirical contributions, this study offers a human-centered and context-sensitive perspective that advances understanding of sustainable logistics in both developed and emerging market contexts. By juxtaposing consumer-driven sustainability challenges with organization-driven operational solutions, the research bridges micro-level behavioral insights and macro-level supply chain strategy. This integrative approach provides a robust foundation for future research aimed at designing logistics systems that are both environmentally responsible and operationally resilient. For practitioners and policymakers, the findings highlight the importance of embedding sustainability into core logistics design rather than treating it as an adjunct objective, thereby enabling long-term value creation in increasingly complex global supply networks.

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