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From dreadful to digital: A conceptual framework for effective online consumer returns management through reverse logistics digitisation

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Background: Online retailing is characterised by high and variable product returns. Many retailers rely on manual processes or ineffective systems, hindering product returns management. Reverse logistics (RL) digitisation can address inefficiencies and improve returns management.

Objectives: This study synthesised the literature to identify RL digitisation barriers, consequences, practices and outcomes, and dominant versus targeted relationship patterns to inform a conceptual framework for effective online consumer returns management.

Method: A structured literature synthesis extracted, coded and integrated concepts and relationships into higher-level categories and mapped linkages, which informed an evidence-based, stepwise decision framework.

Results: Digitisation is constrained by financial, organisational, information technology (IT) and synergy barriers, which produce financial, operational, information, IT, organisational, governance, and external consequences. Practices involving appropriate system functionalities and technologies, internal resources and support, and external resources and supply chain relationships can address barriers and enable financial, operational, information and IT, organisational, supply chain and market-related benefits. Dominant links indicated systemic levers with multi-domain influence, while targeted links revealed pathways to resolve specific bottlenecks.

Conclusion: Effective consumer returns management can be realised if retailers use the framework to diagnose dominant exposures, prioritise targeted bottlenecks and sequence practices to remove barriers before expecting benefits, thereby embedding integration and information visibility internally and externally.

Contribution: The study provided an evidence map and a stepwise framework to guide diagnosis, prioritisation, portfolio selection based on practice–barrier and practice–benefit fit, and monitoring of barriers addressed and benefits realised.

Keywords: reverse logistics; product returns; product returns management; online retailing; digitisation; information systems; Industry 4.0; conceptual framework.

Introduction

Reverse logistics (RL) is increasingly important for value recovery and profitability (Oltra-Badenes et al. 2019:1). Growth in online marketplaces has increased return volumes and variability (Flora et al. 2024:237; Mahindroo, Samalia & Verma 2018:550). Product returns are a structural feature of online retailing, with reported online return rates of about 10% – 15% (Subramoniam et al. 2021:1). Pandemic-era surges amplified economic, operational and environmental burdens, increasing the need to prioritise RL and returns strategically (Frei, Jack & Krzyzaniak 2022:1, 14). Efficient return flows therefore became critical to online retailer performance and customer satisfaction (Batrisyia & Fernando 2024:92; Rostamzadeh et al. 2020:653).

Reverse logistics involves the backflow of goods, information and related resources from consumption to origin to recapture value or ensure responsible disposition (Naseem, Yang & Xiang 2021:2; Sharma, Kikkeri & Varma 2019:577). Reverse logistics differs from forward logistics in direction, variability and decision rules (Scherer 2017:11; Wenta & Wierzbicki 2020:19), and includes collection, inspection, disassembly, sorting, disposition, redistribution and waste

Note: Additional supporting information may be found in the online version of this article as Online Appendix 1.

handling (Rostamzadeh et al. 2020:636). Reverse logistics shifted from a cost centre to a strategic lever for efficiency and sustainability through waste reduction, resource optimisation and competitive positioning (Adesoga et al. 2024:162–164). Reverse logistics also supports environmental compliance and evolving expectations about return policies (Da Silva & Freire 2020:98347), but implementation remains challenging because of uncertainty, poor information and multiple decision variables (Abid & Mhada 2021:1463–1464; Plaza-Úbeda et al. 2021:1). Many online retailers still underestimate returns or treat them as unavoidable costs, limiting investment and senior oversight (Demajorovic, Santos & Da Silva Oliveira 2019:911; Frei et al. 2022:12).

Because customers interact across forward and reverse supply chains, online retailers must coordinate information, goods and funds from initial contact through return resolution (Frei et al. 2022:3). Returns management applies RL through policy design, customer-friendly return mechanisms, disposition decisions and timely execution of refunds, replacements or reintegration into inventory (Adesoga et al. 2024:163; Naseem et al. 2021:2). Although efficient RL reduces costs and improves customer satisfaction and retention, many organisations still rely on manual methods that cause delays and inefficiencies (Flora et al. 2024:236; Panigrahi et al. 2018:152; Scherer 2017:11).

Given the complexity and speed of RL, information management is critical. Information technology (IT) platforms must handle return routing, condition assessment, multi-criteria disposition and traceability, yet most systems are designed for forward logistics and fail to meet RL requirements (Oltra-Badenes et al. 2019:1; Wenta & Wierzbicki 2020:26).

Industry 4.0 and specialised systems can improve visibility, automate decisions and streamline RL operations (Adesoga et al. 2024:166; Batrisyia & Fernando 2024:91; Ritola, Krikke & Caniëls 2020:7), but integration is hindered by legacy enterprise resource planning (ERP), data complexity, interoperability issues and limited digital skills (Da Silva & Freire 2020:98370; Rodrigues et al. 2025:2–3, 17). Returns management is therefore constrained by the lack of suitable, integrated IT systems that are essential to RL success (Rostamzadeh et al. 2020:642; Scherer 2017:12).

These realities motivated the study through practice and research gaps. Reverse logistics processes often remain fragmented, manual and prolonged across multiple locations and parties (Frei et al. 2022:6), with returns not being prioritised strategically, resulting in limited senior oversight and underinvestment in appropriate IT (Frei et al. 2022:12).

Current solutions remain poorly adapted to RL uncertainty and decision complexity, and RL functions are rarely implemented in computer systems (Oltra-Badenes et al. 2019:2; Scherer 2017:12). Organisations also face cost and collaboration barriers and perceptions that reverse flows are not worth the effort (Plaza-Úbeda et al. 2021:1; Sari et al. 2018:53). These challenges are acute in developing countries with infrastructure, capability and investment gaps (Moktadir et al. 2020:720; Swain, Mishra & Mahapatra 2024:4496–4497). Misperceptions that RL is merely cost-generating continue to undermine returns performance (Demajorovic et al. 2019:911).

In the research domain, literature on online returns and RL systems remains limited and concentrated in developed markets (Frei et al. 2022:14; Panigrahi et al. 2018:167). Studies call for broader, empirically grounded research across sectors and countries, deeper analyses of RL processes, and frameworks linking IT to consumer-returns applications beyond solid-waste contexts (Plaza-Úbeda et al. 2021:14; Rodrigues et al. 2025:3). Research on Industry 4.0 technologies for RL remains limited relative to forward logistics, and adoption studies often focus on manufacturing (Krstić et al. 2022:5; Naseem et al. 2026:5). Scholars also highlight the need for work on information systems and artificial intelligence (AI) for online returns, including benefits and implementation challenges for sustainable returns strategies (Da Silva & Freire 2020:98372; Frei et al. 2022:14). Further research is needed on digital integration in RL and on linking forward logistics and RL for economic and environmental benefits (Verbivska et al. 2023:506). Uncertainty and insufficient information reinforce the importance of mapping barriers and IT capabilities for RL management (Abid & Mhada 2021:1476; Ritola et al. 2020:2).

These gaps were approached through a socio-technical and information-processing lens. Reverse logistics digitisation was therefore not viewed as a technology-acquisition issue only, but as a coordinated change process in which information flows, system capabilities, organisational readiness and supply chain relationships jointly shape returns performance. This positioning is consistent with studies showing that RL digitisation is constrained by inadequate IT systems, weak integration and technology and data risks (Badenhorst 2022:330; Karlsson et al. 2023:7; Panjehfouladgaran & Lim 2020:1461; Senthil, Murugananthan & Ramesh 2018:718), and that successful RL implementation also requires managerial commitment, strategic planning, skills development and supply chain collaboration (Ahlén & Johansson 2023:17; Badenhorst 2022:330; Karlsson et al. 2023:8–9; Moktadir et al. 2020:720; Pramono, Ulkhaq & Aulia 2021:3).

To address gaps in research and practice, this conceptual article draws on a literature synthesis to: (1) identify the barriers that prevent RL digitisation, (2) synthesise the consequences that arise when these barriers persist, (3) identify practices that enable RL digitisation, (4) determine the outcomes of implementing these practices (barriers addressed and benefits realised) and (5) analyse dominant and targeted relationships between barriers, consequences, practices and benefits to inform a stepwise conceptual framework for effective online consumer returns management. The contribution of the study lies in connecting fragmented evidence on barriers, consequences, practices

and outcomes into a relationship-based decision logic that helps online retailers stabilise systemic constraints before addressing targeted bottlenecks. Prior studies have provided important insights into specific elements of RL and returns management, including consumer returns practices, RL collaboration, digital technologies and RL system capabilities (Hjort et al. 2019:788; Mahadevan 2019:482–504; Oltra-Badenes et al. 2019:1; Rodrigues et al. 2025:1, 6, 15). Building on these contributions, the framework extends the discussion by linking barriers, consequences, practices and benefits into an implementation sequence that distinguishes systemic levers from bottleneck-specific interventions.

The research questions that guided the study are the following:

- **RQ1:** What prevents RL digitisation?
- **RQ2:** What are the consequences of RL digitisation barriers?
- **RQ3:** What are the practices to digitise RL?
- **RQ4:** What are the outcomes of RL digitisation practices?
- **RQ5:** What are the more dominant and targeted relationships between RL digitisation barriers, consequences, practices and benefits for effective consumer returns management?

The remainder of the article presents the literature review, research methodology, results aligned with the research questions, the conceptual framework, and the conclusion with managerial recommendations, limitations and future research directions.

Literature review

Reverse logistics digitisation barriers and consequences

According to Plaza-Úbeda et al. (2021:13), important RL barriers include financial resources, management inattention, a lack of appropriate human resources (i.e. skilled staff), and a lack of IT systems. In this study, the literature was consolidated into four higher-order RL digitisation barrier clusters: financial, organisational, IT and synergy barriers.

Financial constraint barriers and consequences

Financial constraint barriers to RL digitisation include financial investment requirements and high costs. Reverse logistics requires substantial financial investment in infrastructure, IT systems and skilled personnel (Badenhorst 2022:229; Pramono et al. 2021:3; Zailani et al. 2017:35). Online retailers seeking to manage returns effectively must allocate funds for IT infrastructure, staff training and appropriate system capabilities (Pramono et al. 2021:3; Ravi & Shankar 2015:15; Sirisawat & Kiatcharoenpol 2018:304).

However, many online retailers prioritise forward logistics, viewing it as a profit centre, while RL is often perceived as a cost-generating activity, leading to retailers' reluctance in committing financial resources (Mahadevan 2019:483; Mahindroo et al. 2018:560). Misperceptions that RL is merely cost-generating continue to undermine the effectiveness and efficiency of product return flows (Demajorovic et al. 2019:911), especially in developing countries, where RL is often perceived as a cost rather than a value-adding activity (Sari et al. 2018:65).

High initial investment costs for infrastructure, technology and workforce training exacerbate financial barriers, particularly for smaller online retailers (Adesoga et al. 2024:165). Limited budgets result in poor infrastructure and insufficient RL investment needed for digital adoption (Bajar et al. 2024:163), while organisations often struggle to justify RL systems and IT infrastructure expenses (Sari et al. 2018:54). High implementation and operating costs limit advanced IT deployment and timely information flows (Moktadir et al. 2020:732; Rodrigues et al. 2025:12, 15). Consequently, tracking and tracing systems are rarely implemented, complicating uncertainty in return volumes, frequency and sources (Frei, Jack & Brown 2020:1619; Jović et al. 2020:160; Ravi & Shankar 2015:20).

Organisational barriers and consequences

Organisational barriers begin with the failure to prioritise product returns, leading to limited top management control and reluctance to invest in essential IT systems (Frei et al. 2022:12). A lack of awareness of the financial, brand and environmental value of RL reduces IT resource allocation and contributes to inadequate infrastructure and poor decisions (Chen et al. 2017:261; Davidavičienė & Al Majzoub 2021:6; Solati et al. 2023:14). Insufficient top management commitment also leaves RL initiatives without strategic direction, funding and integration (Ahlén & Johansson 2023:17; Bouzon, Govindan & Rodriguez 2018:326; Ravi & Shankar 2015:15), resulting in poor planning, underinvestment and missed benefits (Andresen & Istad 2019:17; Chen et al. 2017:252; Zailani et al. 2017:29).

Management inattention and resistance to change reinforce this problem. When forward logistics dominates managerial focus, RL remains fragmented, delayed and poorly overseen, increasing cost and reducing customer satisfaction (Badenhorst 2017:618, 2022:229; Chen et al. 2017:252). Resistance from managers and staff accustomed to manual practices slows adoption and undermines RL strategies without effective change management (Pramono et al. 2021:3; Sari et al. 2018:55). Weak strategic planning further limits internal and external coordination, investment, scalability and reputation (Chen et al. 2017:261; Karlsson et al. 2023:8–9; Panjehfouladgaran & Lim 2020:1461).

Skills and training gaps also constrain digitisation. Even when RL technologies are available, limited staff competence can cause data inaccuracies, bottlenecks and underperforming systems (Ermes & Niemann 2023:7; Pramono et al. 2021:3), often because investment in staff development remains limited (Moktadir et al. 2020:720; Sari et al. 2018:56).

Information technology barriers and consequences

Product return management depends on strong information systems and infrastructure (Jović et al. 2020:160), yet many organisations use legacy IT that is ineffective for returns (Badenhorst 2017:619, 2022:330). Online retailers may continue manual operations despite available integrated solutions (Frei et al. 2022:10), partly because IT adoption is associated with integration concerns (Rodrigues et al. 2025:12). Manual recording and outdated algorithms create delays, inefficiencies, higher costs and poor inventory management (Badenhorst 2022:330; Flora et al. 2024:236–237; Panigrahi et al. 2018:152; Scherer 2017:11), reducing competitiveness against more innovative retailers (García-Sánchez, Guerrero-Villegas & Aguilera-Caracuel 2019:5).

Inadequate and incapable IT is another barrier (Badenhorst 2022:330; Karlsson et al. 2023:7). Many systems lack RL-specific capabilities (Lai et al. 2022:4), remain non-interoperable, and fail to track products, reconcile refunds or support the return journey (Frei et al. 2022:10). Because most systems are designed for forward logistics, they often do not meet RL requirements (Oltra-Badenes et al. 2019:1; Wenta & Wierzbicki 2020:26), leaving retailers without real-time purchase, return and refund data (Zhang et al. 2023:2, 10). This weakens analytics, visibility, information sharing and return-prevention efforts (Bozzi, Neves & Mont'Alvão 2022:11; Karlsson et al. 2023:7; Mahadevan 2019:483).

A lack of IT infrastructure further impedes RL digitisation (Lamba et al. 2020:398; Meyer et al. 2017:12). Inadequate IT infrastructure is characterised by fragmented IT, outdated warehouse equipment and poor data management, undermining RL efficiency (Davidavičienė & Al Majzoub 2021:8; Frei et al. 2020:1619). Information technology infrastructure barriers are often identified as more critical than physical infrastructure constraints for RL (Naseem et al. 2021:16). Without adequate IT infrastructure, organisations cannot implement digital RL technologies, leaving them vulnerable to inefficiencies and competitive disadvantages (Bajar et al. 2024:163, 165).

Organisations also face technology and data risks from rapid changes and erosion of IT capabilities, increasing uncertainty in RL operations (Panjehfouladgaran & Lim 2020:1461). Ineffective information systems introduce risks such as data inaccuracies, security breaches and disruptions in return information flows (Senthil et al. 2018:718), undermining both operational performance and strategic decision-making in RL.

Synergy barriers and consequences

Synergy barriers include internal and external integration, information sharing, support and collaboration challenges. Digital RL implementation can create internal integration complexities that hinder performance (Rodrigues et al. 2025:15). Inadequate IT integration fragments processes and information sharing (Dapiran & Kam 2017:831; Soltany et al. 2018:780), while inconsistent return data across departments reduces returns management efficiency (Frei et al. 2020:1619; Karlsson et al. 2023:7). Limited real-time communication further restricts timely exchange and organisational commitment to RL (Zailani et al. 2017:27), especially when forward and reverse flows must be integrated using systems not designed for RL compatibility (Batrisyia & Fernando 2024:100).

Lack of supply chain partner synergy also limits RL digitisation. Effective RL requires partner support (Badenhorst 2022:330; Moktadir et al. 2020:720) because collaboration improves return visibility and cost-efficiency (Andresen & Istad 2019:16; Bouzon et al. 2018:326). However, limited cooperation with third-party reverse logistics providers (3PRLs) can reduce customer service, confidence and profitability (Lamba et al. 2020:388), while poor coordination restricts system integration and RL process efficiency (Bozzi et al. 2022:19).

A lack of supply chain information sharing further disrupts RL operations and visibility. Without shared platforms, data integrity, consistency and efficiency are compromised (Meyer et al. 2017:12). Failure to exchange timely and accurate return data reduces visibility and effective returns management (Badenhorst 2022:330), while poor IT integration and information flows undermine RL process effectiveness and efficiency (Bozzi et al. 2022:19; Zailani et al. 2017:29).

Overall, the barrier literature suggests a tension rather than a simple solution pathway. Retailers need digital capability to improve visibility, control and coordination, but digitisation itself depends on funding, management attention, skills and integration readiness. This demonstrates the importance of treating barriers as interdependent clusters rather than isolated obstacles. The literature also suggests that the dominant barriers may differ by context. Resource-constrained settings emphasise funding and infrastructure, while technology-focused studies emphasise system capability, interoperability and data visibility. This contextual variation informed the later distinction between dominant barrier and consequence relationships requiring early systemic attention and targeted relationships requiring context-specific interventions.

Reverse logistics digitisation practices

Appropriate RL digitisation practices can help online retailers to address barriers and realise various benefits, resulting in the effective management of consumer product returns. The main RL digitisation practice categories identified from the literature include appropriate IT systems, internal support and resources, and external resources and supply chain relationships.

Appropriate information technology systems

Several practices related to appropriate IT systems for RL digitisation can be implemented, including IT with appropriate functionalities and various appropriate systems.

These include Web-based systems and tracking technologies, traditional information systems, RL systems and software, and Industry 4.0 (digital) technologies.

Appropriate information technology system functionalities: Information technology system functionalities are essential for effective supply chain and product returns management, reducing RL costs and improving process effectiveness (Attia 2021:1; El Hail & El Koraichi 2024:58). Online retailers should prioritise IT systems with advanced capabilities to manage the complexities of RL and product returns.

Integration is a critical IT functionality for RL (Rostamzadeh et al. 2020:648), supporting both internal and external integration, real-time information sharing and centralised goal alignment (Karlsson et al. 2023:8; Mostert, Niemann & Kotzé 2017:8–9). Internally, IT with integration functionalities facilitates coordination between inventory planning and RL processes, automates decision-making, improves operational efficiency (Mo et al. 2022:12), and links forward and reverse flows for cost-efficiency (Oltra-Badenes et al. 2019:11).

Externally, IT with integration functionalities enables supply chain integration and efficient information sharing among partners (Frei et al. 2020:1618; Meyer et al. 2017:13), resulting in cost savings, improved RL effectiveness (Attia 2021:1), efficient communication and RL process synchronisation (Rodrigues et al. 2025:7).

Adaptability is equally important, allowing IT to respond to fluctuating return volumes and changing requirements (Flora et al. 2024:239). An IT system that can be adapted to support RL operations ensures that all return processes and activities are well executed (Oltra-Badenes et al. 2019:3). Modular architectures and cloud-based designs can be adapted for online product returns to scale resources dynamically, ensuring consistent performance under varying product return volumes (Flora et al. 2024:239). Enterprise resource planning systems with customisable modules can integrate diverse organisational functions, enabling a streamlined and well-managed return process (Oltra-Badenes et al. 2019:1; Scherer 2017:12–14).

Information technology systems must be capable of providing usable and timely information (Attia 2021:3), making information management another key functionality. Information technology systems should store comprehensive product return data and consumer feedback to identify operational inefficiencies and support continuous improvement (Meyer et al. 2017:13). High-quality, real-time information and communication are important for informed RL decision-making (Bajar et al. 2024:160; Mo et al. 2022:4; Starostka-Patyk 2021:2594) and internal and external synchronisation of RL activities (Karlsson et al. 2023:8; Park 2018:69). Systems offering advanced analytics can help to identify return patterns, optimise RL operations and reduce future returns (Ahlén & Johansson 2023:31; Dapiran & Kam 2017:832). Tracking and tracing capabilities provide end-to-end product visibility (Frei et al. 2020:1619; Sari et al. 2018:64), while automated identification and barcode scanning improve operational efficiency and prevent counterfeits (Verbivska et al. 2023:500–502).

Finally, IT systems must support comprehensive RL management and control (Oltra-Badenes et al. 2019:1; Ritola et al. 2020:6), including control over return rates (Bozzi et al. 2022:15; Mahindroo et al. 2018:561), RL accounting and cost calculation (Oltra-Badenes et al. 2019:11). Control over return rates helps reduce operational inefficiencies and enables strategic benefits, such as cost optimisation and improved customer satisfaction (Bozzi et al. 2022:15; Mahindroo et al. 2018:561). Advanced systems should integrate detailed cost models to account for RL and automate data processing for financial transparency, cost reductions, resource optimisation and prevention of accounting errors (Oltra-Badenes et al. 2019:11; Verbivska et al. 2023:502).

Appropriate Web-based systems and tracking technologies: Appropriate Web-based and tracking systems, including return tracking systems and radio-frequency identification (RFID), add significant value to pre- and post-sale operations. Web-based systems help online retailers enhance the shopping experience and reduce unnecessary returns by enabling more informed purchase decisions (Ahsan & Rahman 2022:157; Robertson, Hamilton & Jap 2020:172). Tools like chatbots and augmented reality applications reduce consumer uncertainty about fit and style, serving as pre-sales prevention measures (Robertson et al. 2020:172). Beyond pre-sales solutions, Web-based return-tracking technologies are effective for monitoring and verifying returned products (Starostka-Patyk 2021:2591) and for digitising RL processes, thereby improving return visibility and control and helping to avoid bottlenecks and high operational costs (Batrisyia & Fernando 2024:96).

Radio-frequency identification is also important for monitoring and verifying product returns (Starostka-Patyk 2021:2591), enabling real-time tracking and identification without physical contact, increasing inventory accuracy, reducing pilferage risk (Frei et al. 2020:1616; Rodrigues et al. 2025:7) and improving RL efficiency (Attia 2021:9). Radio-frequency identification supports automated sorting, route optimisation and provides granular data for analytics, demand forecasting and return prediction (Ritola et al. 2020:8; Rodrigues et al. 2025:14–15), which help to reduce waste, improve operational efficiency (Rodrigues et al. 2025:14–15), improve decision-making and align RL practices with sustainability and efficiency goals (Plaza-Úbeda et al. 2021:11–14). Additional RFID benefits include optimising return processes, enhancing visibility, preventing fraudulent claims (Biswas & Abdul-Kader 2018:1021; Zhang et al. 2023:15), facilitating sorting (Biswas & Abdul-Kader 2018:1022; Zhang et al. 2017:157), enabling real-time data sharing, and strengthening supply chain collaboration and transparency (Ermes & Niemann 2023:8).

Appropriate traditional information systems: If properly implemented, online retailers can use traditional IT systems such as ERP, customer relationship management (CRM) software, warehouse management systems (WMS) and electronic data interchange (EDI) to support RL digitisation and streamline product return processes (Starostka-Patyk 2021:2591). Enterprise resource planning systems integrate data across departments, improving coordination, information flow and real-time tracking of inventory and financials (Scherer 2017:12). The modular architecture of ERP systems provides flexibility and scalability for changing RL requirements (Scherer 2017:12–14). Enterprise resource planning can also reduce storage and operational costs, improve delivery and optimise returns via modules such as SAP's Return Material Authorisation (RMA) (Oltra-Badenes et al. 2019:3). Solutions such as Microsoft Dynamics Navision (NAV) manage repairs, returns, inventory adjustments, cost accounting, support quick response to returns and enable integration with other applications (Scherer 2017:12–14).

Customer relationship management systems enhance RL network design by improving customer engagement and communication during returns (Andresen & Istad 2019:5). Electronic (E-)CRM applications, which use digital technologies with CRM, help online retailers understand return reasons to improve forward logistics, prevent returns, reduce RL costs and enhance customer relationships (El Hail & El Koraichi 2024:57, 61). Warehouse management systems optimise warehouse operations by providing real-time storage information, improving resource allocation and reducing inventory risks (Park 2018:69). Integrating ERP and WMS synchronises warehouse and return operations, enhancing RL performance (Oltra-Badenes et al. 2019:3). Using WMS for consumer returns can speed up processing, enable quick product identification for fast restocking and resale, and increase disposition efficiency (Fox 2023:6).

Electronic data interchange automates document exchange in standardised formats, eliminating inefficiencies in RL documentation (Verbivska et al. 2023:504). Electronic data interchange also supports cross-functional and inter-organisational information sharing, boosting productivity, lowering administrative costs and improving RL efficiency (Attia 2021:9; Verbivska et al. 2023:504). Through EDI, logistics partners can share transport plans and inspection reports, thus enhancing coordination and reducing return process delays (Sharma et al. 2019:578).

Appropriate reverse logistics systems and software: To digitise RL and manage consumer returns, online retailers can implement a dedicated return management system (RMS) and RL software to automate workflows and streamline processes (Ahlén & Johansson 2023:31; Bozzi et al. 2022:21; Hjort et al. 2019:788). Return management system platforms help identify return trends, improve services and implement preventive measures, offering faster processing, greater efficiency, enhanced customer experience and lower return volumes via data-driven insights (Fox 2023:5). An RMS improves customer service (Park 2018:75) and satisfaction by providing real-time status updates and accurate handling of returns, thus building trust and loyalty (Flora et al. 2024:239). Operational benefits of an RMS include better inventory accuracy, fewer processing errors and quick responses to return requests, which support cost optimisation and resource use (Flora et al. 2024:241; Park 2018:75). Therefore, online retailers can use an RMS to increase product return visibility and eliminate manual RL operations for a streamlined return process (Park 2018:75).

Reverse logistics software and automated sorting systems optimise RL by reducing lead times and improving resource usage (Adesoga et al. 2024:165). Automating return requests and gatekeeping streamline return processing, facilitating effective returns management (Hjort et al. 2019:788). Product return portals can prevent fraud by verifying returns and capturing detailed data to detect suspicious behaviour, which saves RL costs (Zhang et al. 2023:11). Advanced RL systems also support tracking and tracing, allowing managers to monitor products across the supply chain and improve product recovery processes (Mo et al. 2022:3; Sari et al. 2018:64).

Appropriate Industry 4.0 and digital technologies: Industry 4.0 and digital technologies, including the Internet of Things (IoT), blockchain, AI, machine learning (ML), cloud computing and big data analytics (BDA), can transform RL by enabling automation, real-time visibility, advanced decision-making, integration and improved resource use (Rodrigues et al. 2025:1, 6, 15; Subramoniam et al. 2021:6).

The IoT connects physical and digital assets through sensors and networks, enabling real-time monitoring of product condition, location and returns (Adesoga et al. 2024:166; Krstić et al. 2022:20; Rodrigues et al. 2025:6, 12, 14; Zhang et al. 2017:157). It improves visibility, disposition decisions, routing, sorting and return monitoring (Batrisyia & Fernando 2024:91; Mo et al. 2022:8; Rodrigues et al. 2025:12, 15–16), with reported benefits including cost savings, RL efficiency, sustainability, better customer service, reduced risk and extended product life cycles (Krstić et al. 2022:20–21; Mo et al. 2022:4; Subramoniam et al. 2021:2).

Blockchain supports secure, decentralised data exchange and immutable records, improving transparency and traceability in RL (Adesoga et al. 2024:166; Rodrigues et al. 2025:12, 16; Subramoniam et al. 2021:9). It can verify product authenticity, link returns to original purchases, prevent fraudulent returns and reduce delays (Bajar et al. 2024:135, 143; Jović et al. 2020:164), while smart contracts can support compliance and automate refunds or warranty claims (Bajar et al. 2024:160–166).

Artificial intelligence and ML support predictive analytics, resource allocation and automated decisions in RL. Artificial intelligence can analyse return patterns, forecast demand, optimise routing and sorting, and improve process efficiency and monitoring (Adesoga et al. 2024:166; Batrisyia &

Fernando 2024:91; Rodrigues et al. 2025:12, 15–16). Machine learning can refine categorisation and disposal strategies, improve recovery decisions and enhance efficiency, competitiveness, decision-making and customer satisfaction (Flora et al. 2024:241; Rodrigues et al. 2025:16).

Cloud computing enables remote storage and processing of return data, improving RL efficiency, costs, value recovery, risk reduction and product life-cycle extension (Krstić et al. 2022:21; Rodrigues et al. 2025:7, 17). It also supports supply chain integration, coordination, information sharing, flexibility and scalable processing (Flora et al. 2024:236–239; Rodrigues et al. 2025:15), while cloud-based RMS can automate disposition decisions, reduce manual work and errors, and improve customer satisfaction through faster processing and real-time updates (Flora et al. 2024:238–241).

Big data analytics transforms large datasets into actionable insights for RL optimisation and real-time decisions (Rodrigues et al. 2025:7, 13). It improves communication, tracking, information processing and disposition strategies to optimise resources and reduce waste (Rodrigues et al. 2025:15–16). When combined with IoT or RFID, BDA can identify disposition patterns, reduce human errors and improve return insights through efficient data collection (Ritola et al. 2020:7; Rodrigues et al. 2025:15).

Internal support and resources

In addition to IT practices, internal support and resources are needed to create the readiness conditions for RL digitisation. These include financial commitment and resources, managerial commitment and strategic planning, and managerial support.

Financial commitment and resources involve sustained investment in IT infrastructure, system functionalities and staff training (Pramono et al. 2021:3; Ravi & Shankar 2015:15; Sirisawat & Kiatcharoenpol 2018:304). Digitising RL requires funding for hardware, software and scalable solutions (Meyer et al. 2017:13; Rodrigues et al. 2025:17), guided by cost-benefit analyses for long-term competitiveness and sustainability (Ritola et al. 2020:10).

Such investment supports integrated platforms, cloud systems, automation, fraud detection, return-pattern analysis and staff capability, improving efficiency, visibility, reliability and strategic value (Davidavičienė & Al Majzoub 2021:19; García-Sánchez et al. 2019:3; Mahindroo et al. 2018:562; Sari et al. 2018:64).

Managerial commitment and strategic planning prioritise RL as a strategic function (Frei et al. 2022:12). When executives recognise the economic and strategic benefits of RL, they are more likely to commit resources and integrate RL into corporate strategies (Ahlén & Johansson 2023:4, 32). Top management also supports resource allocation, planning, awareness, IT adoption and infrastructure development (Badenhorst 2017:611; Chen et al. 2017:261; Karlsson et al. 2023:8), helping address financial barriers, resistance, weak planning and partner synergy challenges (Ahlén & Johansson 2023:32; Badenhorst 2017:611–612).

Managerial support enables RL digitisation by influencing funding, training, technology adoption and change management (Moktadir et al. 2020:737; Sari et al. 2018:55). It ensures that staff can use IT systems and manage returns effectively (Andresen & Istad 2019:15; Lamba et al. 2020:384), covering technical skills, system maintenance and returns handling (García-Sánchez et al. 2019:2–4; Sari et al. 2018:56, 64). Skilled staff can improve information sharing, RL performance and customer experience (Fox 2023:20; García-Sánchez et al. 2019:3–4), while change management helps overcome resistance (Sari et al. 2018:55).

External resources and supply chain relationships

Online retailers lacking sufficient internal resources can use external resources and supply chain relationships, such as outsourcing, collaboration and partnerships, to advance RL digitisation. Outsourcing to 3PRLs can help overcome financial and technological constraints (Wang, Wang & Chan 2021:2) because 3PRLs provide return services, advanced IT systems and infrastructure (Frei et al. 2020:1619; Rostamzadeh et al. 2020:642).

Outsourcing can reduce technology investment and asset requirements (Badenhorst 2017:611–613; Gu et al. 2019:160; Le 2023:15–16), support end-to-end visibility through system integration, and reduce RL costs and lead times (Park 2018:68–69, 75). However, the 3PRL must be selected according to IT and integration capabilities that align with RL digitisation goals (Rostamzadeh et al. 2020:648; Wang et al. 2021:11).

Supply chain collaboration and partnerships help overcome financial constraints, IT gaps and information-sharing problems (Ahlén & Johansson 2023:32; Badenhorst 2017:611–613). Collaboration enables resource-sharing, improved RL capabilities and real-time information exchange (Moktadir et al. 2020:720), while compatible partner systems support RL efficiency, transparency, tracking and collaboration (Attia 2021:4). Contracts covering shared platforms and communication strengthen synchronisation across logistics flows (Batrisyia & Fernando 2024:100; Mostert et al. 2017:10, 13), and partnerships with technology suppliers and online platforms optimise returns, reduce costs and improve customer satisfaction (Flora et al. 2024:237; Rodrigues et al. 2025:12).

The practice literature therefore suggests that technologies and organisational enablers must be selected together. Technology-based practices promise visibility, automation and efficiency, but organisational and relational practices determine whether those technologies can be funded, adopted, integrated and used consistently. This supports the interpretation of RL digitisation practices as a socio-technical portfolio rather than a list of standalone technologies.

Research methodology

Study design

A structured literature synthesis was used to extract, code and integrate concepts and relationships from the literature into higher-level categories and mapped linkages. This approach synthesises representative literature into new conceptual frameworks rather than estimating causal effects (Torraco 2005:356); it also accommodates diverse evidence and applies qualitative analysis for rigour (Whittemore & Knafl 2005:546). Framework development followed conceptual network building to support multidisciplinary understanding (Jabareen 2009:49). The synthesis was concept-centric and analytical, as it compared perspectives across studies, identified tensions and boundary conditions, and used these interpretations to explain why certain relationships were dominant or targeted.

Sampling strategy and data collection

A purposive, iterative sampling strategy was used, combining a foundational set from prior doctoral research and an updated set for this article. Purposive sampling relied on researcher judgement (Saunders et al. 2019:315), while iterative sampling allowed for the inclusion of additional literature as new information was identified (Booth et al. 2013:5). The updated search focused on peer-reviewed articles and high-quality conference papers using keywords related to RL barriers, management practices, digitisation, consumer returns management, and digital practices. Only publications with extractable insights on barriers, consequences, practices and outcomes relevant to RL digitisation and consumer returns were included.

Data analysis

Analysis involved thematic coding, narrative synthesis and evidence mapping. Text and concepts were coded into: (1) barriers, (2) consequences, (3) digitisation practices and (4) benefits, using line-by-line coding and theme development (Thomas & Harden 2008:3). ATLAS.ti supported coding, retrieval and documentation. The literature review synthesised coded categories into a structured narrative, which served as the basis for tables and matrices (Online Appendix 1: Table 1-OA1, Table 2-OA1, Table 3-OA1, Table 4-OA1 and Table 5-OA1). Relationship matrices mapped linkages to distinguish dominant versus targeted patterns, consistent with concept-centric synthesis (Webster & Watson 2002:xvii)

Trustworthiness and rigour

Trustworthiness and rigour were enhanced by: (1) providing structured outputs (Online Appendix 1: Table 1-OA1, Table 2-OA1, Table 3-OA1, Table 4-OA1 and Table 5-OA1) for transparency (Torraco 2005:356), (2) maintaining an audit trail of coding, definitions and refinements, (3) applying consistency checks to reduce redundancy and improve clarity, (4) using ATLAS.ti logs for documentation, (5) applying two-way logic in matrix interpretation to avoid one-sided conclusions, (6) linking higher-order themes to extracted text for transparency (Thomas & Harden 2008:3) and (7) acknowledging that linkage-based synthesis indicates patterns, not causal magnitude (Torraco 2005:356).

Ethical considerations

The study was based solely on published literature and excluded any involvement from human participants or the analysis of primary interview data. However, ethics clearance for conceptual research was obtained from the Research Ethics Review Committee of the College of Economic and Management Science, University of South Africa (No 2018_CEMS_ESTTL_002).

Results

The thematic synthesis produced summary tables of RL digitisation barriers and consequences and practices and outcomes and evidence-mapping matrices linking barriers, consequences, practices and benefits. These outputs informed the conceptual framework for managing consumer returns through RL digitisation.

Reverse logistics digitisation barriers and consequences

This section synthesises the literature on RL digitisation barriers in online returns settings and the consequences that arise when these barriers persist, thus answering RQ1 and RQ2. Online Appendix 1, Table 1-OA1 summarises RL digitisation barriers and related consequences.

RQ1: What prevents reverse logistics digitisation?

Online Appendix 1, Table 1-OA1 shows that barriers to RL digitisation are clustered into four groups: financial constraint, organisational, IT and synergy barriers. Financial constraints include high upfront costs for systems, infrastructure and skills, and difficulty justifying investment when RL is seen as a cost rather than a value-add. Organisational barriers involve limited RL awareness, lack of top management commitment, management inattention, resistance to change, weak strategy and training gaps. Information technology barriers cover a lack of IT adoption, inadequate or incapable systems, insufficient infrastructure and technology and data risks. Synergy barriers relate to poor internal integration and limited collaboration and information sharing with partners. These RL digitisation barriers are mutually reinforcing. For instance, under-investment and weak governance limit IT acquisition and use, leading to ineffective systems and inefficiencies. Even with some IT adoption, the lack of integration and data sharing reduces system value. Therefore, the foundational barriers of resources, governance, skills and integration must be addressed alongside technology adoption.

RQ2: What are the consequences of reverse logistics digitisation barriers?

The synthesis indicates that RL digitisation barriers generate consequences across several domains: cost (e.g. constrained budgets and profitability pressures), operational (e.g. inefficiencies and bottlenecks), information and IT (e.g. limited visibility, poor data management and weak systems), organisational and governance (e.g. ineffective RL management, weak planning and ineffective decision-making) and external (weak supply chain coordination and market-related pressures) domains. The dominant consequence pathways indicate that barriers undermine information and coordination mechanisms required for stable RL processes, visibility, control, information exchange and interoperable systems. As a result, operational inefficiency and uncertainty can be primary consequences because RL processes depend on accurate, integrated information.

Reverse logistics digitisation practices and outcomes

This section synthesises the literature on RL digitisation practices and associated implementation outcomes, answering RQ3 and RQ4. Online Appendix 1, Table 2-OA1 provides a consolidated summary of the RL digitisation practices and related outcomes (barriers addressed and benefits realised).

RQ3: What are the practices to digitise reverse logistics?

The literature portrays RL digitisation as a portfolio of complementary interventions, spanning: (1) appropriate IT system functionalities (integration, adaptability, information management, and RL management and control) and IT systems (tracking and Web-based solutions, traditional IT systems, dedicated returns systems, Industry 4.0 digital technologies), (2) internal support and resources (financial commitment and resources, managerial commitment and strategic planning, and managerial support) and (3) external resources and supply chain relationships (outsourcing and supply chain collaboration and partnerships). Practice selection is best viewed as a socio-technical portfolio, where enabling practices support adoption and sustained use, and IT practices provide specific improvements (e.g. visibility, integration, automation and analytics).

RQ4: What are the outcomes of reverse logistics digitisation practices?

Outcomes are conceptualised as the barriers addressed (i.e. the extent to which practices mitigate or remove RL digitisation barriers) and the benefits realised (i.e. the performance and value domains associated with practice implementation). Online Appendix 1, Table 2-OA1 links each practice with the main barriers that can be addressed and the benefits realised, indicating that practices function as mechanisms for barrier reduction while simultaneously enabling value outcomes. Barrier-related outcomes include addressing high investment and cost constraints, improving IT adoption and system adequacy, mitigating organisational constraints, reducing integration complexity and addressing supply chain synergy complexities. Benefit-related outcomes involve financial (cost savings, resource optimisation, recovery), operational (streamlined processes, reduced lead times and errors), IT and information (visibility, data management, automation and integration, analytics), organisational (RL management facilitation, strategic alignment and change readiness) and external (supply chain synergy and customer and market outcomes) domains.

Treating outcomes as both barrier reduction and benefit realisation strengthens the explanatory logic of RL digitisation programmes. Online Appendix 1, Table 2-OA1 can be used by retailers to match a desired outcome with practices that address relevant barriers. For example, financial outcomes may require a combination of IT systems with integration and control functionalities, tracking or Industry 4.0 technologies, internal financial support and external collaboration.

This reinforces the portfolio logic where benefits are more likely when enabling barriers are reduced alongside technology implementation.

Reverse logistics digitisation relationships for effective consumer returns management

RQ5: What are the more dominant and targeted relationships between reverse logistics digitisation barriers, consequences, practices and benefits for effective consumer returns management?

RQ5 was addressed by interpreting the evidence-mapping matrices (Online Appendix 1: Table 3-OA1, Table 4-OA1 and Table 5-OA1) to distinguish dominant, cross-cutting relationship patterns from targeted pathways. A dominant relationship refers to a linkage with broad influence across multiple barrier, consequence, practice or benefit domains, while a targeted relationship refers to a bounded linkage addressing a specific bottleneck or outcome domain. Row-wise and column-wise readings identified systemic leverage points and bottleneck-specific links.

Online Appendix 1, Table 3-OA1 represents the RL digitisation barrier–consequence matrix based on the synthesis presented in Table 1-OA1.

Online Appendix 1, Table 3-OA1 identifies the dominant and targeted relationships between RL digitisation barriers and consequences.

The most cross-cutting barriers mapped to multiple consequence domains are financial constraints, inadequate and incapable IT systems, and lack of IT adoption, indicating wider exposure to cost and performance risks. These barriers are strong candidates for early-stage prioritisation because addressing them can reduce multiple downstream problems simultaneously. Barriers with narrower consequence linkage exhibit more bounded pathways, with impacts concentrated in fewer consequence domains. These targeted barriers are

analytically valuable, indicating specific bottlenecks (e.g. a concentrated skills gap or discrete data-risk problem) that can be addressed through focused interventions once foundational constraints are stabilised. Consequence domains with wide linkage (i.e. operational and RL process inefficiencies and uncertainties, poor and incapable IT and information and integration problems) across the barriers indicate where RL performance is most sensitive to digitisation constraints, emphasising the significance of RL digitisation for effective returns management.

Consequence domains with fewer linkages (i.e. investment and lack of funding pressures, supply chain synergy problems and competitive and market-related problems) may reflect more context-dependent effects. Therefore, less frequently linked domains should be interpreted in the context of the online retailer's business and strategic priorities rather than assumed to be unimportant.

Online Appendix 1, Table 4-OA1 represents the RL digitisation practice–barrier matrix, based on the synthesis presented in Online Appendix 1, Table 2-OA1.

Online Appendix 1, Table 4-OA1 identifies the dominant and targeted relationships between RL digitisation practices and barriers. High-coverage practices (i.e. outsourcing, cloud computing, the IoT, financial and managerial commitment and IT with integration capabilities) address multiple barrier categories and offer broader leverage for barrier removal and programme momentum. These practices can play a foundational, enabling role by supporting adoption, integration and sustained use across multiple constraint areas. Practices with narrower barrier coverage (i.e. Web-based tracking, adaptability functionality, CRM and WMS) can be interpreted as more targeted and positioned as complementary solutions once enabling conditions are established, or as targeted solutions where an online retailer's barrier profile is narrow and clearly defined. Barriers associated with many practices (i.e. lack of IT adoption, ineffective IT systems and financial constraints) can be interpreted as more widely addressable through multiple intervention routes, allowing online retailers flexibility in practice selection and portfolio design. Barriers associated with fewer practices (i.e. skills and training gaps and a lack of top management commitment) can be interpreted as potential bottlenecks that may require explicit enablement or targeted interventions, such as partnerships and outsourcing.

Online Appendix 1, Table 5-OA1 represents the RL digitisation practice–benefits matrix based on the synthesis presented in Online Appendix 1, Table 2-OA1.

Online Appendix 1, Table 5-OA1 identifies the dominant and targeted relationships between RL digitisation practices and benefits. Reverse logistics digitisation practices linked with many benefit domains (i.e. the IoT, cloud computing and solutions, AI and ML, financial commitment and resources, and outsourcing) can be interpreted as broad-return interventions and may be valuable early in implementation, where the objective is to stabilise returns execution and deliver visible improvements across multiple performance areas. Practices linked with fewer benefit domains (i.e. adaptability functionality, managerial commitment and strategic planning) represent more focused interventions where selection will depend on alignment with specific outcome objectives. Benefits linked with many practices (i.e. RL process and operational efficiency and visibility and real-time information sharing) can be interpreted as more widely attainable benefit domains likely to emerge across multiple RL digitisation portfolios. Benefits linked with fewer practices (i.e. skills and training capability and access to IT systems and infrastructure) can be interpreted as more selective outcomes that require deliberate practice selection and explicit monitoring.

Overall, the relationship patterns supported a sequenced portfolio approach: address cross-cutting constraints with high-coverage practices, then use targeted interventions for specific bottlenecks and selective benefits, while monitoring barriers addressed and benefits realised.

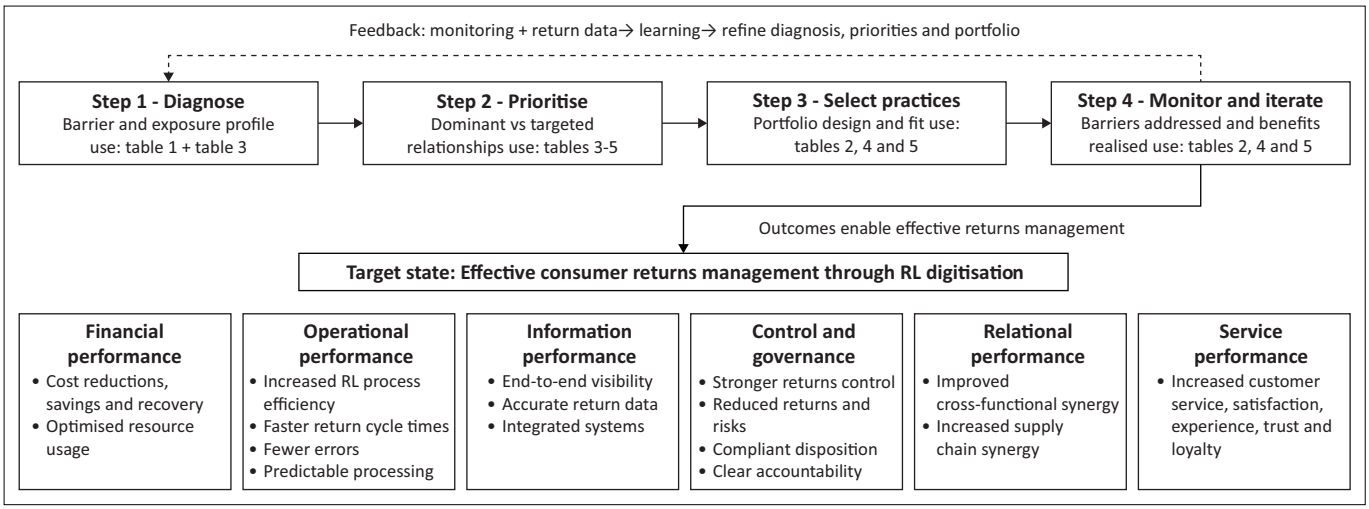
Theoretically, these patterns confirm that RL digitisation value is not created by technology adoption alone, but by aligning technological capability with organisational readiness and inter-organisational information flows. Dominant relationships indicate where systemic constraints shape multiple outcomes, whereas targeted relationships indicate where specific interventions may resolve bounded bottlenecks. This interpretation supports the framework's sequencing logic and explains why retailers should address enabling conditions before expecting benefits from advanced digital tools.

Conceptual framework for effective consumer returns management through reverse logistics digitisation

The framework translated the evidence base into a decision sequence: diagnose barriers and exposures, prioritise dominant versus targeted relationships, select a sequenced practice portfolio and monitor outcomes to embed RL digitisation as a capability for effective consumer returns management. Effective consumer returns management is defined here as the ability of an online retailer to execute the end-to-end returns process consistently and transparently while controlling costs, risks, value recovery, partner relationships and customer experience. Figure 1 presents the stepwise conceptual framework.

The steps and the framework outcomes are described as follows:

- Step 1 – Diagnose (barrier profile and exposure profile): Use Online Appendix 1, Table 1-OA1 and Table 3-OA1 to identify the barrier profile (cross-cutting versus targeted



RL, Reverse logistics.

FIGURE 1: Stepwise decision framework for managing consumer returns through reverse logistics digitisation.

barriers) and exposure profile (most affected consequence domains) to locate vulnerability points in the returns system.

- Step 2 – Prioritise (dominant vs targeted relationships): Use Online Appendix 1, Table 3-OA1, Table 4-OA1 and Table 5-OA1 to prioritise cross-cutting barriers and performance domains first, then identify bottlenecks and selective benefits that require targeted monitoring.
- Step 3 – Select practices (portfolio design and fit): Use Online Appendix 1, Table 2-OA1, Table 4-OA1 and Table 5-OA1 to design a sequenced portfolio based on practice–barrier fit and practice–benefit fit, combining enabling measures with targeted technologies.
- Step 4 – Monitor and iterate (barriers addressed and benefits realised): Use Online Appendix 1, Table 2-OA1, Table 4-OA1 and Table 5-OA1 to track whether barriers are being reduced and intended benefits are realised, then use return data to refine the diagnosis, priorities and practice portfolio.
- Target state – Effective consumer returns management through RL digitisation: Applying the framework should improve financial, operational, information, governance, relational and service outcomes by reducing costs and errors, increasing visibility and control, strengthening collaboration and improving customer experience.

Conclusion

Summary of key findings

The synthesis showed that RL digitisation is constrained by interdependent financial, organisational, IT and synergy barriers. These barriers create cost pressures, operational inefficiency, limited visibility, weak returns control and integration problems, indicating that RL digitisation should be managed as a socio-technical change programme rather than a discrete technology procurement decision. Practices should therefore be selected as a portfolio of system capabilities, technologies and enabling measures, with outcomes assessed as both barriers addressed and benefits realised.

The dominant versus targeted relationship patterns provide the article's main decision logic. Dominant relationships identify systemic levers with multi-domain influence, while targeted relationships identify bottleneck-specific pathways. The framework translates this logic into diagnosis, prioritisation, practice selection and monitoring for sustained improvements in consumer returns management.

Managerial recommendations

Online retailers should treat RL digitisation as capability-building for effective consumer returns management, rather than a stand-alone system implementation. A practical start is to map the end-to-end returns journey and track a small set of indicators (e.g. cycle time to refund, error rates, data completeness, recovery value and fraud exposure) to establish a baseline. Using the baseline, online retailers should diagnose internal (resources, skills, governance, systems) and external (partner coordination, information sharing) constraints, then prioritise dominant, cross-cutting barriers disrupting execution and information flow. Once stabilised, online retailers can address specific bottlenecks (e.g. processing delays) with targeted interventions. Practice selection should follow a sequenced portfolio logic that combines enabling measures (leadership, planning, change management, integration readiness and collaboration) with targeted technologies to address barriers and realise benefits. Each practice should be mapped to its targeted barrier and intended benefit, as adopting technologies without readiness and integration alignment risks partial or unstable results. Finally, implementation should be monitored through both barriers addressed (e.g. adoption, integration, data quality, readiness) and benefits realised (e.g. efficiency, visibility, control, decision support, customer outcomes). Return data should be used for feedback to refine the diagnosis, reprioritise and update the practice portfolio, ensuring continuous improvement in returns management.

Limitations and future research directions

This study used a structured literature synthesis to identify relationship patterns and linkage breadth, not causal effects. The matrices therefore indicate dominant versus targeted relationships, not importance rankings or statistical effect sizes. The findings should also be interpreted in terms of potential literature-base bias. Available studies were unevenly distributed across contexts, with some evidence concentrated in developed-market, manufacturing, technology or sector-specific settings, while online retail and developing-country contexts were less consistently represented. Future research should validate and refine the framework across varied online retail contexts through qualitative case studies and, where appropriate, surveys assessing whether different barrier–consequence profiles and sequenced practices improve consumer returns management.

Finally, while the framework recommends a sequenced portfolio approach, real-world sequencing decisions and organisational impacts were not observed directly. Comparative case studies could examine how online retailers choose between foundational and targeted practices, negotiate sequencing decisions across functions and partners and translate monitoring data into iterative redesign. Longitudinal designs could also test whether addressing dominant barriers before targeted bottlenecks produces stronger returns-management outcomes.

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Competing interest

The author declares that no financial or personal relationships inappropriately influenced the writing of this article.

CRediT authorship contribution

Amanda Nieuwoudt: Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Resources, Validation, Visualisation, Writing – original draft, Writing – review & editing. The author confirms that this work is entirely their own, has reviewed the article, approved the final version for submission and publication, and takes full responsibility for the integrity of its findings.

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Data availability

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Disclaimer

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References

Abid, S. & Mhada, F.Z., 2021, 'Simulation optimisation methods applied in reverse logistics: A systematic review', *International Journal of Sustainable Engineering* 14(6), 1463–1483. https://doi.org/10.1080/19397038.2021.2003470

Adesoga, T.O., Olaiya, O.P., Onuma, E.P., Ajayi, O.O. & Olagunju, O.D., 2024, 'Review of reverse logistics practices and their impact on supply chain sustainability', *International Journal of Science and Research Archive* 12(2), 162–168. https://doi.org/10.30574/ijsra.2024.12.2.1216

Ahlén, A. & Johansson, E., 2023, 'Overcoming barriers for functional reverse logistics in e-commerce A systematic literature review', Bachelor's thesis in International Logistics, Chalmers University of Technology, viewed 12 November 2023, from https://hdl.handle.net/20.500.12380/306146.

Ahsan, K. & Rahman, S., 2022, 'A systematic review of e-tail product returns and an agenda for future research', *Industrial Management & Data Systems* 122(1), 137–166. https://doi.org/10.1108/IMDS-05-2021-0312

Andresen, C.N. & Istad, J., 2019, Reverse logistics in e-commerce: A multiple-case study of four e-commerce companies, Molde University College, Molde.

Attia, A., 2021, 'The effect of information system on the reverse logistics performance', *Academy of Strategic Management Journal* 20(2), 1–12.

Badenhorst, A., 2017, 'Management practices to mitigate barriers in reverse logistics', *Journal of Contemporary Management* 14(1), 595–623, viewed 20 February 2017, from https://hdl.handle.net/10520/EJC-947ba3111

Badenhorst, A., 2022, 'Reverse logistics', in W. Niemann & G. de Villiers (eds.), *Strategic logistics management: A supply chain management approach*, 3rd edn., pp. 231–245, Van Schaik, Pretoria.

Bajar, K., Kamat, A., Shanker, S. & Barve, A., 2024, 'Blockchain technology: A catalyst for reverse logistics of the automobile industry', *Smart and Sustainable Built Environment* 13(1), 133–178. https://doi.org/10.1108/SASBE-11-2021-0203

Batrisyia, N.A. & Fernando, Y., 2024, 'Improving a circular reverse logistics to handle product return: Insights from a global electronics service provider', *International Journal of Industrial Management* 18(2), 91–104. https://doi.org/10.15282/ijim.18.2.2024.10831

Biswas, C. & Abdul-Kader, W., 2018, 'Reverse logistics challenges in e-commerce', in *Proceedings of the 3rd International Conference on Industrial Engineering and Operations Management*, Washington, DC, September 27–29, 2018, pp. 1016–1023, viewed 13 August 2020, from https://ieomsociety.org/dc2018/proceedings/

Booth, A., Harris, J., Croot, E., Springett, J., Campbell, F. & Wilkins, E., 2013, 'Towards a methodology for cluster searching to provide conceptual and contextual "richness" for systematic reviews of complex interventions: Case study (CLUSTER)', *BMC Medical Research Methodology* 13(1), 118. https://doi.org/10.1186/1471-2288-13-118

Bouzon, M., Govindan, K. & Rodriguez, C.M.T., 2018, 'Evaluating barriers for reverse logistics implementation under a multiple stakeholders' perspective analysis using grey decision-making approach', *Resources, Conservation and Recycling* 128, 315–335. https://doi.org/10.1016/j.resconrec.2016.11.022

Bozzi, C., Neves, M. & Mont'Alvão, C., 2022, 'Fashion e-tail and the impact of returns: Mapping processes and the consumer journey towards more sustainable practices', *Sustainability* 14(9), 5328. https://doi.org/10.3390/su14095328

Chen, H., Anselmi, K., Falasca, M. & Tian, Y., 2017, 'Measuring returns management orientation', *International Journal of Physical Distribution & Logistics Management* 28(2), 251–265. https://doi.org/10.1108/IJLM-06-2015-0095

Da Silva, A.L. & Freire, R.Z., 2020, 'Reverse logistics applied to e-commerce: A systematic literature review on methods, applications, and trends for a virtual sustainable market', *Brazilian Journal of Development* 6(12), 98347–98379. https://doi.org/10.34117/bjdv6n12-359

Dapiran, G.P. & Kam, B.H., 2017, 'Value creation and appropriation in product returns management', *The International Journal of Logistics Management* 28(3), 821–840. https://doi.org/10.1108/IJLM-11-2015-0199

Davidavičienė, V. & Al Majzoub, M., 2021, 'Performance of reverse logistics in electronic commerce: A case study from Lebanon and Syria', *Transport* 36(3), 260–282. https://doi.org/10.3846/transport.2021.14956

Demajorovic, J., Bonomi Santos, J. & Da Silva Oliveira, L., 2019, 'Reverse logistics in retail: Barriers and motivation to products and packaging return', *Revista de Administração da Universidade Federal de Santa Maria* 12(5), 911–930. https://doi.org/10.5902/19834659

El Hail, C. & El Koraichi, M., 2024, 'Enhancing supply chain management performance through E-CRM implementation', *International Journal of Supply Chain Management* 13(4), 56–64. https://doi.org/10.59160/ijscm.v13i4.6249

Ermes, T. & Niemann, W., 2023, 'Managing omni-channel reverse logistics risk during supply chain disruption recovery in the South African fashion industry', *Journal of Transport and Supply Chain Management* 17, a932. https://doi.org/10.4102/jtscm.v17i0.932

Flora, T.G.A., Jeslin, J.G., Roychoudri, S., Vijayalakshmi, K., Ponnaian, G. & Velmurugan, S., 2024, 'Cloud-based returns management solutions in logistics using K-Nearest Neighbors approach', in *2nd International Conference on Intelligent Cyber Physical Systems and Internet of Things, ICoICI 2024 – Proceedings*, Institute of Electrical and Electronics Engineers Inc., Coimbatore, India, August 28–30, 2024, pp. 236–241. https://doi.org/10.1109/ICoICI62503.2024.10696138

Fox, R., 2023, *The ultimate guide to reverse logistics for ecommerce*, viewed 22 October 2023, from https://returngo.ai/ultimate-guide-to-reverse-logistics/#:~:text=Reverse%20logistics%20is%20the%20process,validation%2C%20and%20restocking%20or%20disposal.

Frei, R., Jack, L. & Brown, S., 2020, 'Product returns: A growing problem for business, society and environment', *International Journal of Operations and Production Management* 40(10), 1613–1621. https://doi.org/10.1108/IJOPM-02-2020-0083

Frei, R., Jack, L. & Krzyzaniak, S.A., 2022, 'Mapping product returns processes in multichannel retailing: Challenges and opportunities', *Sustainability (Switzerland)* 14(3), 1382. https://doi.org/10.3390/su14031382

García-Sánchez, E., Guerrero-Villegas, J. & Aguilera-Caracuel, J., 2019, 'How do technological skills improve reverse logistics? The moderating role of top management support in information technology use and innovativeness', *Sustainability (Switzerland)* 11(1), 58. https://doi.org/10.3390/su11010058

Gu, W., Wei, L., Zhang, W. & Yan, X., 2019, 'Evolutionary game analysis of cooperation between natural resource- and energy-intensive companies in reverse logistics operations', *International Journal of Production Economics* 218, 159–169. https://doi.org/10.1016/j.ijpe.2019.05.001

Hjort, K., Hellström, D., Karlsson, S. & Oghazi, P., 2019, 'Typology of practices for managing consumer returns in internet retailing', *International Journal of Physical Distribution and Logistics Management* 49(7), 767–790. https://doi.org/10.1108/IJPDLM-12-2017-0368

Jabareen, Y., 2009, 'Building a conceptual framework: Philosophy, definitions, and procedure', *International Journal of Qualitative Methods* 8(4), 49–62. https://doi.org/10.1177/160940690900800406

Jović, M., Schlierf, J., Heinen, B. & Tijan, E., 2020, 'Information management in reverse logistics', *Journal of Maritime & Transportation Science* 58(1), 155–167, viewed 28 March 2022, from https://hrcak.srce.hr/en/240873

Karlsson, S., Oghazi, P., Hellstrom, D., Patel, P.C., Papadopoulou, C. & Hjort, K., 2023, 'Retail returns management strategy: An alignment perspective', *Journal of Innovation & Knowledge* 8(4), 100420. https://doi.org/10.1016/j.jik.2023.100420

Krstić, M., Agnusdei, G.P., Miglietta, P.P., Tadić, S. & Roso, V., 2022, 'Applicability of Industry 4.0 technologies in the reverse logistics: A circular economy approach based on Comprehensive Distance Based Ranking (COBRA) method', *Sustainability (Switzerland)* 14(9), 5632. https://doi.org/10.3390/su14095632

Lai, N.Y.G., Kuah, A.T.H., Kim, C.H. & Wong, K.H., 2022, 'Toward sustainable express deliveries for online shopping: Reusing packaging materials through reverse logistics', *Thunderbird International Business Review* 64(4), 351–362. https://doi.org/10.1002/tie.22259

Lamba, D., Yadav, D.K., Barve, A. & Panda, G., 2020, 'Prioritizing barriers in reverse logistics of e-commerce supply chain using fuzzy-analytic hierarchy process', *Electronic Commerce Research* 20(2), 381–403. https://doi.org/10.1007/s10660-019-09333-y

Le, S.T., 2023, 'Investigating the drivers of the reverse logistics implementation in reducing waste in Vietnam', *Environmental Health Insights* 17(4), 11786302231211058. https://doi.org/10.1177/11786302231211058

Mahadevan, K., 2019, 'Collaboration in reverse: A conceptual framework for reverse logistics operations', *International Journal of Productivity and Performance Management* 68(2), 482–504. https://doi.org/10.1108/IJPPM-10-2017-0247

Mahindroo, A., Samalia, H.V. & Verma, P., 2018, 'Moderated influence of return frequency and resource commitment on information systems and reverse logistics strategic performance', *International Journal of Productivity and Performance Management* 67(3), 550–570. https://doi.org/10.1108/IJPPM-05-2016-0101

Meyer, A., Niemann, W., Mackenzie, J. & Lombaard, J., 2017, 'Drivers and barriers of reverse logistics practices: A study of large grocery retailers in South Africa', *Journal of Transport and Supply Chain Management* 11, a323. https://doi.org/10.4102/jtscm.v11i0.323

Mo, D.Y., Ma, C.Y.T., Ho, D.C.K. & Wang, Y., 2022, 'Design of a reverse logistics system with Internet of Things for service parts management', *Sustainability (Switzerland)* 14(19), 12013. https://doi.org/10.3390/su141912013

Moktadir, M.A., Rahman, T., Ali, S.M., Nahar, N. & Paul, S.K., 2020, 'Examining barriers to reverse logistics practices in the leather footwear industry', *Annals of Operations Research* 293(2), 715–746. https://doi.org/10.1007/s10479-019-03449-y

Mostert, W., Niemann, W. & Kotzé, T., 2017, 'Supply chain integration in the product return process: A study of consumer electronics retailers', *Acta Commercii* 17(1), a487. https://doi.org/10.4102/ac.v17i1.487

Naseem, M.H., Yang, J. & Xiang, Z., 2021, 'Prioritizing the solutions to reverse logistics barriers for the e-commerce industry in Pakistan based on a fuzzy AHP-TOPSIS approach', *Sustainability (Switzerland)* 13(22), 12743. https://doi.org/10.3390/su132212743

Naseem, M.H., Guo, J., Hui, S., Callefi, M.H., Ziquan, X. & Godinho Filho, M., 2026, 'A decision framework for selecting Industry 4.0 technologies in perishable goods reverse logistics', *Journal of Enterprise Information Management* 1–38. https://doi.org/10.1108/JEIM-11-2025-1104.

Oltra-Badenes, R., Gil-Gomez, H., Guerola-Navarro, V. & Vicedo, P., 2019, 'Is it possible to manage the product recovery processes in an ERP? Analysis of functional needs', *Sustainability (Switzerland)* 11(16), 4380. https://doi.org/10.3390/su11164380

Panigrahi, S.K., Kar, F.W., Fen, T.A., Hoe, L.K. & Wong, M., 2018, 'A strategic initiative for successful reverse logistics management in retail industry', *Global Business Review* 19(3 Suppl.), S151–S175. https://doi.org/10.1177/0972150918758096

Panjehfouladgaran, H. & Lim, S.F.W.T., 2020, 'Reverse logistics risk management: Identification, clustering and risk mitigation strategies', *Management Decision* 58(7), 1449–1474. https://doi.org/10.1108/MD-01-2018-0010

Park, D., 2018, 'Implementation of 3PL service providers' efficient reverse logistics management system', *International Journal of Advanced Science and Technology* 119, 67–78. https://doi.org/10.14257/ijast.2018.119.06

Plaza-Úbeda, J.A., Abad-Segura, E., De Burgos-Jiménez, J., Boteva-Asenova, A. & Belmonte-Ureña, L.J., 2021, 'Trends and new challenges in the green supply chain: The reverse logistics', *Sustainability (Switzerland)* 13(1), 331. https://doi.org/10.3390/su13010331

Pramono, S.N.W., Ulkhaq, M.M. & Aulia, Z., 2021, 'Analysing the barriers of reverse logistics implementation: A case study', *IOP Conference Series: Materials Science and Engineering* 1072(1), 012063. https://doi.org/10.1088/1757-899x/1072/1/012063

Ravi, V. & Shankar, R., 2015, 'Survey of reverse logistics practices in manufacturing industries: An Indian context', *Benchmarking: An International Journal* 22(5), 874–899. https://doi.org/10.1108/BIJ-06-2013-0066

Ritola, I., Krikke, H. & Caniëls, M.C.J., 2020, 'Learning from returned products in a closed loop supply chain: A systematic literature review', *Logistics* 4(2), 7. https://doi.org/10.3390/logistics4020007

Robertson, T.S., Hamilton, R. & Jap, S.D., 2020, 'Many (un)happy returns? The changing nature of retail product returns and future research directions', *Journal of Retailing* 96(2), 172–177. https://doi.org/10.1016/j.jretai.2020.04.001

Rodrigues, S.V., De Carvalho Gomes, L., Peres, F.A.P., De Faria Correa, R.G. & Baierle, I.C., 2025, 'A framework for leveraging digital technologies in reverse logistics actions: A systematic literature review', *Logistics* 9(2), 54. https://doi.org/10.3390/logistics9020054

Rostamzadeh, R., Esmaeili, A., Sivilevičius, H. & Nobard, H.B.K., 2020, 'A fuzzy decision-making approach for evaluation and selection of third party reverse logistics provider using fuzzy ARAS', *Transport* 35(6), 635–657. https://doi.org/10.3846/transport.2020.14226

Sari, D., Ulkhaq, M., Rinawati, D. & Rasyida, D., 2018, 'Barriers of reverse logistics implementation: A case study in a car battery industry in Indonesia', *International Journal of Supply Chain Management* 7(5), 53–67, viewed 13 August 2020, from https://ojs.excelingtech.co.uk/index.php/IJSCM/article/view/1978.

Saunders, M.N.K., Lewis, P. & Thornhill, A., 2019, *Research methods for business students*, 8th edn., Person Education Limited, Harlow.

Scherer, M., 2017, 'Management of reverse logistics processes with Microsoft Dynamics NAV', *Production Engineering Archives* 15(15), 11–14. https://doi.org/10.30657/pea.2017.15.03

Senthil, S., Murugananthan, K. & Ramesh, A., 2018, 'Analysis and prioritisation of risks in a reverse logistics network using hybrid multi-criteria decision-making methods', *Journal of Cleaner Production* 179, 716–730. https://doi.org/10.1016/j.jclepro.2017.12.095

Sharma, A., Kikkeri, N. & Varma, I., 2019, 'Role of reverse logistics in product recall: Case study on Nestle Maggi', *International Journal of Advance Research, Ideas and Innovations in Technology* 5(4), 576–580, viewed 12 August 2022, from www.IJARIIT.com.

Sirisawat, P. & Kiatcharoenpol, T., 2018, 'Fuzzy AHP-TOPSIS approaches to prioritizing solutions for reverse logistics barriers', *Computers & Industrial Engineering* 117, 303–318. https://doi.org/10.1016/j.cie.2018.01.015

Solati, S., Shojaei, P., Alimohammadlou, M. & Hesamabadi, Z.H., 2023, 'Reverse logistics implementations solutions: Interval type 2 FAHP-FTOPSIS approach', *Discrete Dynamics in Nature and Society* 2023, 1–17. https://doi.org/10.1155/2023/6805773

Soltany, Z., Rostamzadeh, R. & Skrickij, V., 2018, 'A model to evaluate supply chain technology implementation influence on organizational performance', *Transport* 33(3), 779–792. https://doi.org/10.3846/transport.2018.5468

Starostka-Patyk, M., 2021, 'The use of information systems to support the management of reverse logistics processes', *Procedia Computer Science* 192, 2586–2595. https://doi.org/10.1016/j.procs.2021.09.028

Subramoniam, R., Sundin, E., Subramoniam, S. & Huisingh, D., 2021, 'Riding the digital product life cycle waves towards a circular economy', *Sustainability (Switzerland)* 13(16), 8960. https://doi.org/10.3390/su13168960

Swain, R.R., Mishra, S. & Mahapatra, S.S., 2024, 'An integrated BWM–SWARA approach to identify barriers in implementing reverse logistics for an effective supply chain management: A critical study of five bottle manufacturing companies in Odisha (India)', *International Journal of System Assurance Engineering and Management* 15(9), 4495–4511. https://doi.org/10.1007/s13198-024-02467-9

Thomas, J. & Harden, A., 2008, 'Methods for the thematic synthesis of qualitative research in systematic reviews', *BMC Medical Research Methodology* 8(1), 45. https://doi.org/10.1186/1471-2288-8-45

Torraco, R.J., 2005, 'Writing integrative literature reviews: Guidelines and examples', *Human Resource Development Review* 4(3), 356–367. https://doi.org/10.1177/1534484305278283

Verbivska, L., Zhygalkevych, Z., Fisun, Y., Chobitok, I. & Shvedkyi, V., 2023, 'Digital technologies as a tool of efficient logistics', *Journal of the University of Zulia* 14(39), 492–508. https://doi.org/10.46925/rdluz.39.28

Wang, M., Wang, B. & Chan, R., 2021, 'Reverse logistics uncertainty in a courier industry: A triadic model', *Modern Supply Chain Research and Applications* 3(1), 56–73. https://doi.org/10.1108/mscra-10-2020-0026

Webster, J. & Watson, R.T., 2002, 'Analyzing the past to prepare for the future: Writing a literature review', *MIS Quarterly* 26(2), xiii–xxiii. https://doi.org/10.2307/4132319

Wenta, K. & Wierzbicki, P., 2020, 'Innovative solutions in reverse logistics', *Acta Universitatis Nicolai Copernici. Zarządzanie* 47(1), 19–26. https://doi.org/10.12775/aunc_zarz.2020.1.002

Whittemore, R. & Knafl, K., 2005, 'The integrative review: Updated methodology', *Journal of Advanced Nursing* 52(5), 546–553. https://doi.org/10.1111/j.1365-2648.2005.03621.x

Zailani, S., Govindan, K., Shaharudin, M. & Kuan, E., 2017, 'Barriers to product return management in automotive manufacturing firms in Malaysia', *Journal of Cleaner Production* 141, 22–40. https://doi.org/10.1016/j.jclepro.2016.08.160

Zhang, D., Frei, R., Senyo, P.K., Bayer, S., Gerding, E., Wills, G. & Beck, A., 2023, 'Understanding fraudulent returns and mitigation strategies in multichannel retailing', *Journal of Retailing and Consumer Services* 70, 103145. https://doi.org/10.1016/j.jretconser.2022.103145

Zhang, T., Hou, H., Zhang, J., Yang, J. & Xu, N., 2017, 'Research on B2C e-commerce reverse logistics system based on SD model', in *3rd International Conference on Social Science and Development (ICSSD)*, DEStech Publications, Qingdao, China, December 16–17, 2017, pp. 302–306, https://doi.org/10.12783/dtssehs/icssd2017/19226