Uniglobal of Journal Social Sciences and Humanities
Journal Homepage: www.ujssh.com

Closing the Loop in Circular Procurement: Data Sharing, Relational Governance and Reusable Transport Packaging Returns: An Integrative Literature Review with Implications for Malaysian Food Supply Chains

Gao, Yang[1*] & Mohd Shukri, Amer Fareed[1]

[1]SEGi University, Kota Damansara, 47810 Petaling Jaya, Selangor, Malaysia

*Corresponding author email: 1620014682@qq.com

To link to this article: https://doi.org/10.53797/ujssh.v5i2.23.2026

Abstract: Circular procurement seeks to retain value in materials across organisational boundaries, but procurement studies, returnable-asset models and packaging life-cycle assessments often apply different units of analysis and outcome measures. This integrative review synthesises research on circular procurement, interfirm information exchange, contractual and relational governance, returnable transport item operations and reusable-packaging assessment. A targeted, transparent literature search and backward citation checking were conducted through 8 October 2026 and updated on 22 November 2026. The review is interpretive rather than a PRISMA-style systematic review. Four conclusions emerge. First, firm-level circular procurement ratings do not establish item-level material returns. Second, data quality can enable operational coordination only when identifiers, due dates and custody events are mutually interpretable. Third, trust and joint problem-solving plausibly complement deposits, routing and recovery incentives rather than replace them. Fourth, verified receipt, technical suitability for reuse, realised reuse cycles and environmental benefit must be measured separately. The review develops an auditable return-obligation framework with explicit treatment of unmatched transactions, missing events and observation windows. It proposes empirically discriminating comparisons for future buyer–supplier research and discusses the transferability of these ideas to Malaysian food distribution. The contribution is an integrative measurement and governance agenda, not new primary-data evidence or a claim of net emission savings.

Keywords: Circular procurement, reusable transport packaging, information sharing, relational governance, circularity measurement

1. Introduction

Circular procurement concerns more than selecting suppliers of lower-impact products. It also involves organising purchases, use, retrieval and eventual recovery in ways that preserve material value. A reusable crate, pallet or transport container illustrates the managerial problem. Its continued circulation depends on two or more organisations agreeing who holds the asset, when it is due back and what counts as a completed return. The purchasing contract may express a commitment to reuse, but that commitment is not equivalent to a documented custody transfer or to evidence of another use cycle. Circular supply chain management therefore makes the boundary between firm-level intent and interfirm physical activity analytically consequential (Farooque, Zhang, Thürer, Qu, & Huisingh, 2019; Xu, Jia, Yan, & Chen, 2022).

This boundary is blurred when circular procurement performance is assessed mainly with managerial perceptions or broad composite indicators. In a study of Chinese manufacturers, Farooque, Zhang, Choi, Hartley, and Liu (2024) report positive relationships between circular procurement and several performance dimensions, but a relatively weaker environmental relationship. Lee, Hu, and Lim (2024) demonstrate that circular economy indicators differ sharply in the dimensions and stakeholders they capture. Such studies contribute evidence on practices and constructs, but their results do not, by themselves, disclose how many packaging units left a warehouse, became overdue, returned, survived inspection or circulated again. These are different observations, not alternative labels for the same outcome.

**Corresponding author: 1620014682@qq.com*
https://ujssh.com/ All right reserved.

A separate operations-management literature has examined returnable transport items (RTIs) as circulating inventories subject to uncertain losses, return times, pooling rules and tracking decisions (Glock, 2017; Mahmoudi & Parviziomran, 2020). A third literature distinguishes circularity indicators from logistics cost and life-cycle environmental impacts (Betts, Gutierrez-Franco, & Ponce-Cueto, 2022; Yadav, Silvenius, Katajajuuri, & Leinonen, 2024). However, the measurement conventions of these streams are not always integrated with theories of buyer–supplier information exchange and relational governance. In particular, a technology's ability to record an event is not equivalent to a partner's willingness to share, reconcile and act on the event. Evidence from United States business-to-business industries shows why this matters in practice. Barriers to reusable transit packaging included the absence of mandatory requirements, leaders who did not see its value, perceived complexity, insufficient capacity and cost. Firms that already operated reusable systems were more inclined to expand them (Kudrenko & Hall, 2025).

This review connects those bodies of knowledge around a single question: how can circular procurement commitments be translated into defensible evidence of returnable packaging circulation? The emphasis is on tertiary transport packaging used in business-to-business food supply chains, including returnable crates, pallets and distribution containers. Consumer-facing food-service containers enter the discussion where their measurement and life-cycle lessons are transferable; they are not treated as identical operational systems. Malaysia provides the prospective application context because its national circularity policies make materials recovery salient. Local buyer–supplier transaction evidence for the proposed measures, however, remains to be collected (Ministry of Environment and Water, 2021; Ministry of Housing and Local Government, 2024).

Three review questions structure the analysis. RQ1 asks what existing research actually demonstrates about circular procurement, shared information and packaging returns. RQ2 asks how governance, incentives, operational control and measurement should be combined to test a return mechanism without conflating accounting events and physical reuse. RQ3 asks which research designs and indicators can provide credible evidence in Malaysian food distribution. The article contributes a cross-stream synthesis, an explicit outcome hierarchy, an auditable return-obligation model and a prioritised research agenda. It does not assert new observations of Malaysian firms.

2. Review Methodology

2.1 Review design and search boundary

An integrative, concept-centred review is appropriate when studies use different methods and estimands, including surveys, relational theory, analytical RTI models, case studies, circularity indicators and life-cycle assessment (LCA). Following Snyder (2019) and the traceability emphasis of Seuring and Gold (2012), the synthesis was structured around comparable concepts and evidence boundaries rather than pooled numerical effects. The review is not presented as a systematic review, meta-analysis or complete census of published work. It does not claim PRISMA screening counts, duplicate independent reviewers or comprehensive access to subscription databases.

Targeted searches of publicly indexed scholarly publisher pages, DOI records and institutional repositories were conducted on 8 October 2026, supplemented by backward reference checking from established reviews. Search combinations included “circular procurement” with “performance” or “supplier”, “reusable packaging” with “metrics”, “returnable transport item” with “tracking” or “management”, “circular economy” with “information sharing”, and “reusable food packaging” with “life cycle assessment”. Policy searches were restricted to official Malaysian government publications. A supplementary benchmark search on 22 November 2026 targeted journals of Elsevier, Wiley, Springer Nature, Sage, Emerald and Taylor & Francis for studies of reusable transport packaging operations, returnable packaging systems and circular buyer–supplier governance. It added eight publications, and all bibliographic records were re-resolved against Crossref. The reference list records the sources selected for close conceptual synthesis rather than all hits returned by these searches. Publisher abstracts were used where full texts were not openly accessible; the corresponding claims are phrased at that evidential level.

2.2 Eligibility, coding and synthesis

Peer-reviewed journal research and reviews were prioritised if they directly addressed circular procurement, interfirm coordination or information sharing, RTI flows, reusable-packaging circularity metrics, or the environmental and economic boundary of reuse. Earlier foundational studies were retained when they supplied mechanisms that recent studies still employ, including relational rents, contract complementarity and RTI control. Policy documents were included as contextual material, not as evidence that firms have implemented the specified measurement procedures. Papers focused only on material recycling without implications for packaging circulation were excluded from the main synthesis.

Each selected source was read against four analytic prompts: (a) its unit of analysis; (b) its evidence type and setting; (c) the operational or environmental outcome actually measured or modelled; and (d) what the finding cannot establish. These attributes were grouped into the streams shown in Table 1. The coding was qualitative and interpretive; it was not an inter-rater reliability exercise and does not support estimates of the prevalence of a claim across the full research field. Later sections distinguish original study findings from this review’s proposed synthesis and future hypotheses.

Table 1. Evidence streams and their different inference boundaries

Evidence stream	Representative sources and evidence type	Supported contribution	Inference boundary
Circular procurement	Xu et al. (2022): review; Farooque et al. (2024): manufacturer survey/cases	Identifies antecedents, practices and firm-level performance associations	Does not verify individual packaging returns
Relational governance	Dyer and Singh (1998): theory; Poppo and Zenger (2002): interfirm study; Cao and Zhang (2011): survey	Explains knowledge-sharing routines, trust and contract complementarity	Not a causal test of RTI return flows
Information and traceability	Jäger-Roschko and Petersen (2022): review; Zhang and Seuring (2024): use-case review	Clarifies information requirements and visibility applications	System availability does not confirm receipt
RTI operations	Hellström and Johansson (2010): simulation/case; Kim and Glock (2014): modelling; Glock (2017): review	Models tracking, replenishment, uncertainty and asset control	Model assumptions are not Malaysian field outcomes
Circularity and impact metrics	Betts et al. (2022): metric design/case; Lee et al. (2024): indicator analysis	Separates asset-loop measures from business and environmental impacts	Circularity score alone is not LCA
Food-packaging impacts	Yadav et al. (2024): LCA; Espinoza-Orias and Lundquist (2025): review	Shows importance of use cycles, logistics, washing and system boundary	Context-specific LCA cannot be transported unchanged

The scope has two further limits. First, the included studies span different asset classes, countries and time horizons. The synthesis therefore addresses mechanisms and measurement choices, not the average impact of data sharing on packaging return rates. Second, this focused evidence map could omit relevant non-English or inaccessible literature. A future systematic review would need a prespecified multi-database query, complete eligibility log, dual-screening protocol and documented risk-of-bias procedures. The present article instead offers an openly bounded integrative argument with its sources visible.

3. Circular Procurement and Interfirm Coordination

3.1 Procurement performance is not packaging circulation

The procurement literature locates circular purchasing within firm-level capabilities, institutional pressures and the design of contracts and relationships. Xu et al. (2022) organise prior work into antecedents, procurement practices and outcomes, exposing how early research concentrated on different stages of the purchasing process. Farooque et al. (2024) then test relationships between practices and performance in a manufacturer sample. These contributions help specify what firms might change, but performance remains sensitive to the chosen construct and informant. A high score for purchasing circular materials can coexist with poor collection of returnable crates, just as efficient returns can coexist with costly or carbon-intensive recovery routes.

The distinction matters because an index can aggregate outcomes that are not causally interchangeable. Kristensen and Mosgaard (2020) show the diversity of micro-level circular economy indicators and the relative emphasis on some circulation strategies; Lee et al. (2024) identify uneven coverage of circularity dimensions and supply-chain participants. Grimm (2025), using a procurement-to-waste boundary in another industry, further illustrates how indicator boundaries change what counts as progress. A useful synthesis is therefore to treat procurement practice, recoverable-asset behaviour and final environmental impact as separate analytic layers. Where possible, performance measurement should preserve the ability to explain each layer rather than combine them into an opaque score.

3.2 Data quality and actionable interfirm information

Information exchange is a plausible enabling mechanism for keeping reusable assets in circulation. Jäger-Roschko and Petersen (2022), in a systematic literature review, emphasise the conditions under which information sharing can support circular-economy activities. Zhang and Seuring (2024) review digital product passport applications, showing the range of transparency and traceability use cases but also the gap between proposed use cases and established real-world operations. For transport packaging, the immediate need may be simpler than a product passport: agreed identifiers, dispatch events, return obligations, custody confirmations and exception-resolution responsibilities.

Data exchange has at least four distinct attributes: completeness, timeliness, semantic interoperability and auditability. Completeness means that the parties observe the relevant dispatch, due, handover and receipt events. Timeliness means that operational users receive exception information early enough to plan a pickup. Interoperability means that both organisations interpret packaging categories, quantity units and asset IDs consistently. Auditability means that a disputed transaction can be traced to an original source and a documented correction. Better digital connectivity might improve one attribute while leaving another unresolved. Thus, "sharing more data" should not be equated with sharing usable evidence.

The distinction is reinforced by analytical research on tracking. Kim and Glock (2014) examine radio-frequency identification (RFID) under stochastic container returns, demonstrating within a model why more informative asset observations can influence inventory decisions. Their model does not demonstrate a field-estimated causal effect of RFID adoption in Malaysian food networks. Karmaker, Al Aziz, Ahmed, Misbauddin, and Moktadir (2023) associate Industry 4.0 technologies, supply-chain practices and sustainability performance in another context. Such survey constructs say something about organisational capability but do not independently validate a physical return count. Technology readiness and return outcomes must therefore be linked by explicit events and operational rules.

3.3 Relational governance, incentives and coordination

The relational view places value-creating knowledge-sharing routines and effective governance at the level of exchange between firms (Dyer & Singh, 1998). Cao and Zhang (2011) provide evidence that collaboration can support collaborative advantage and firm performance, although the measured outcomes are broader than reusable asset returns. Poppo and Zenger (2002) find that formal contracts and relational governance may complement one another in interorganisational exchange. These results motivate a specific expectation: a common exception ledger may be useful only when partners have a credible process for accepting corrections, assigning responsibility and completing retrieval.

Trust can reduce reluctance to disclose loss or damage, but trust need not eliminate the need for deposits, return fees, clearly allocated ownership or auditable receipts. Wang, Liu, Huo, and Zhao (2023) examine economic and relational investments in third-party logistics information sharing; their setting reinforces the value of modelling both mechanisms. A financial deposit can encourage an overdue item to be returned even where information exchange is weak. Conversely, trustworthy records without a feasible collection route may improve visibility rather than the physical rate of recovery. The mechanisms can be complementary, substitutive or conditional on operating conditions; the literature does not warrant assuming one universal direction for every dyad. Recent circular-economy studies lean towards relational mechanisms without resolving the question. A case study of buyer–supplier relationships reshaped by circular-economy goals found high mutual dependence. Governance rested on trust, continuous information exchange and joint action rather than on coercive power (Trevisan, Bortoluzzi, Formentini, & Ellram, 2025). In a survey-based supplier performance analysis, Bag, Rahman, Gupta and Jabbour (2026) found that contractual governance had no significant influence on supplier cost performance in circular supply chains. Trust-based relationships were central. Neither study observed asset returns, so both remain evidence about governance climates rather than about recovered crates.

An actionable governance construct must accordingly be distinguished from general partnership satisfaction. Relevant behaviours include joint reconciliation of inconsistent quantity records, agreement on custody-transfer evidence, scheduling return pickups, resolving damaged-asset liability and documenting the closure of disputes. These are transaction-level routines. Treating them as part of an observable process lets future research test whether the association between data quality and returns persists. The test should account for deposits, pickup frequency and baseline asset-loss history.

4. Returnable Transport Packaging as an Operating System

4.1 Assets, uncertainty and control policies

Reusable transport packaging is both an item of inventory and an input to logistics capacity. When crates do not return, replacement expenditure rises, while unexpected delays can interrupt the next shipment. Glock (2017) reviews decision-support models for RTI closed-loop supply chains; Mahmoudi and Parviziomran (2020) group reusable-packaging work around economic and environmental implications, network designs and operations decisions. These studies are valuable because they connect asset recovery to fleet sizing, routing and operating cost rather than treating return as a voluntary sustainability action. Accorsi, Cholette, Manzini and Mucci (2022) applied an optimisation model to a real reusable-container network serving the Italian fresh-food supply chain. The pooler's plan could be improved even with uncertainty about where and when containers would be collected for backhaul. Collection uncertainty is thus an operating parameter as well as a governance problem.

Combining an empirical case with simulation, Hellström and Johansson (2010) show that the choice of RTI control strategy can affect operating and investment costs. Monitoring is not the only relevant lever. Kim, Glock, and Kwon (2014) examine stochastic return timing and deteriorating products, identifying decision consequences for return lot sizes and service reliability. Breen (2006) studies the repercussions of customer non-compliance in returning distribution

equipment. Together, these studies imply that a supply chain can improve measured performance through collection frequency, stock ownership, return incentives or transport coordination, not solely through improved data exchange.

The correct unit for testing such mechanisms is often the buyer–supplier relationship for a defined asset category and observation cohort. A delivery route or pooling network may involve additional intermediaries; the visible supplier-to-buyer relationship does not necessarily identify the party that controls final custody. Mapping actor responsibilities is therefore essential before calculating outcomes. A crate scanned at an intermediate depot is not necessarily returned to the agreed owner, and the transfer from a distributor to a subcontractor does not automatically close an obligation.

4.2 What the literature does and does not observe

Operations models frequently make the return fraction, lead time or loss process a parameter and examine planning consequences. Surveys observe perceptions of cooperation or system maturity; audits can observe transactions, but only where partners grant permission and records can be reconciled. These are different evidence levels. A modeled higher mean return rate under tracking, for example, is a scenario assumption or simulation result until validated against an appropriate field comparison. Nor can a single warehouse inventory balance reliably reveal the origin and due date of the units physically received.

Recent work on reverse logistics places additional emphasis on network risk and implementation barriers. Rouhani, Wardley, and Hassanzadeh Amin (2025) review reverse logistics and closed-loop supply-chain issues across implementation settings. Dang, Duong, Zhou, and Meng (2026) synthesise risk and resilience in closed-loop systems. These perspectives extend the operating model: disruptions, changes in delivery frequency, supplier turnover and the allocation of reverse-logistics costs may cause return problems even if core records are accurate. An empirical model should therefore include logistics conditions and network disruption indicators as potential common causes or effect modifiers. Retail evidence adds the cost of handling returns at the receiving end. From 30 interviews with store managers, Raible, Holweg, Reiner and Teller (2024) show that returnable packaging with a deposit-refund system increases process complexity and requires investment in equipment and service. An upstream procurement indicator would not record these costs.

5. Measurement Architecture: From Due Return to Verified Reuse

5.1 Separate obligations, receipt, condition and reuse

This review proposes four stages as a measurement architecture rather than reports them as an observed empirical result. Stage 1 defines the obligation: which asset units are due for return, to whom and by what date. Stage 2 identifies a verified custody event: which of those obligations have documented physical receipt at the accepted return point. Stage 3 establishes technical suitability: which received units can be cleaned or repaired and used again. Stage 4 observes actual recirculation: which suitable units are subsequently dispatched for another use. A life-cycle impact calculation requires an additional model of production, transport, cleaning, disposal, food losses and avoided alternatives. No single return percentage substitutes for these different outcomes.

The hierarchy is consistent with the distinction made by Betts et al. (2022) between circularity and broader impact metrics and with the indicator problems reviewed by Lee et al. (2024). It also guards against a classification error. A damaged crate can be physically received but never reused, while a product exchanged in a pool can be used again without returning to its original warehouse. In both cases the asset, functional cycle and custody boundary must be defined before the numerator is constructed. A dashboard that reports all these events as a single “reuse rate” is liable to conceal important operational differences.

Table 2. Proposed auditable hierarchy of returnable-packaging outcomes

Level	Proposed measure	Required evidence	What it does not show
1. Return obligation	Eligible units with due dates (D)	Agreed issue/dispatch and due-date rules	That any unit has returned
2. Verified return	Matched physical receipts / eligible due units (V/D)	Linked custody receipts, cut-off and reconciliation log	That returned units are reusable
3. Reusability	Serviceable receipts / inspected receipts	Inspection, cleaning and disposition coding	That a subsequent use occurred
4. Realised reuse	Documented subsequent uses / defined asset cohort	Asset or controlled batch cycle history	Net savings from those uses
5. Economic impact	Cost per completed packaging service	Purchase, retrieval, cleaning, loss and admin costs	Life-cycle environmental benefit
6. Environmental impact	Impact per functional packaging service	Comparable LCA inventory and system boundary	Field causal effect of procurement governance

5.2 Cohort-defined denominator and treatment of ambiguity

For a designated dyad i and packaging category, let D_i denote the number of units whose documented return obligation falls due within a fixed observation cohort. Let V_i denote units with a matching physical return receipt before a predeclared cut-off, U_i denote units with unresolved custody evidence at that cut-off, and N_i denote units verified as not returned within the same rule. The bookkeeping identity is given in Eq. (1), and the conservative verified-return fraction in Eq. (2), provided each obligation is uniquely counted and right-censored obligations have been treated according to a prespecified inclusion rule. A conservative verified-return fraction is V_i / D_i when D_i exceeds zero. This is a proportion of confirmed return obligations, not an estimate of undiscovered receipts or of achieved reuse cycles.

(1)

(2)

If the objective is to bound the underlying physical return rate when the unresolved status could conceal a completed receipt, its lower and upper bounds are the interval in Eq. (3). The interval is a transparent worst-case sensitivity range rather than a probability-based confidence interval. The proportion U_i / D_i, given in Eq. (4), should be reported alongside it as an ascertainment warning. A resolved-only ratio, Eq. (5), may be useful diagnostically, but it is not interchangeable with the original denominator and can be biased by selective ascertainment. Negative inventories, duplicate IDs, inconsistent packaging units and unverified transfers must be reconciled or reported; none should silently disappear from the denominator.

(3)

(4)

(5)

The cohort is particularly important where dispatch and return dates differ. Dividing receipts during one calendar month by dispatches during the same month mixes return obligations from different vintages. A fixed due-date cohort with an explicit grace period improves interpretability and reduces seasonality-related denominator errors. Long-turnaround asset categories may require survival or time-to-return methods instead of a three-month binary cut-off. When only batch-level counts are possible, double entry or cross-company reconciliation provides partial assurance, but the paper must not describe them as unique item-level verification.

5.3 Minimum event ledger and reconciliation protocol

An auditable ledger should record a pseudonymous dyad, packaging category, batch or asset key, dispatch event, receiving actor, expected return actor, due date, custody-transfer evidence, physical receipt date, damage status, subsequent reuse event where available, original data source and reconciliation status. Each correction should preserve both partners' original statements and the reason for the adjustment. Routine controls include consistent units of measure, detection of duplicate events, plausible stock balances and resolution rules for third-party custody. These procedures are a proposed synthesis of the literature, not a certified international standard.

Measurement uncertainty should be reported as an outcome in its own right. If a network with strong digitalisation also has more complete receipts, a naive analysis might wrongly associate data sharing with superior returns simply because undocumented receipts are differently observed. Comparing lower/upper return bounds, match rates and missing-

record profiles across partners can reveal this problem. Reconciliation quality is simultaneously a process construct and a potential source of differential outcome measurement; it should not be treated as a harmless administrative detail.

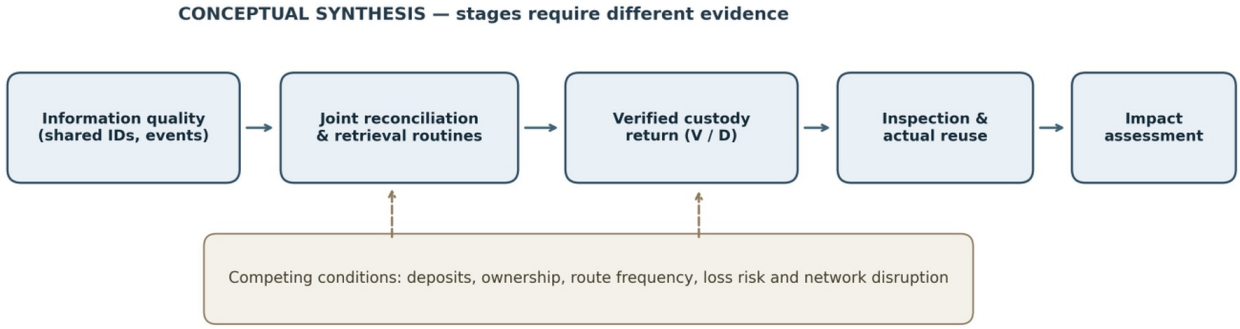

Figure 1. Review-derived information–governance–return pathway; arrows indicate testable mechanisms, not established causal effects

6. Reuse, Environmental Assessment and Scope Conditions

6.1 A return event is not an environmental result

The environmental merits of a reusable package depend on the service it delivers and on the processes needed to deliver that service. Coelho, Corona, ten Klooster, and Worrell (2020) review diverse reusable-packaging systems and their design choices. Yadav et al. (2024), in an LCA of a reusable food container, show that outcomes depend on use frequency and on the logistics and cleaning system. The reported scenario comparisons should not be generalised to every crate or return network. Espinoza-Orias and Lundquist (2025) specify good-practice questions for assessments of reusable food and beverage systems, emphasising the importance of consistent system boundaries and functional units.

Cottafava et al. (2024) likewise caution that assumptions about uses, transport and sanitisation can change single-use versus reusable comparisons. Hemachandra, Hadjikakou, and Pettigrew (2024) show why food waste attributable to packaging deserves attention in life-cycle comparisons. These findings imply that a verified return is an intermediate operational event, whereas environmental effects arise from the realised number of uses, avoided alternatives and incremental burdens. Even when recoveries increase, additional collection kilometres, damaged products or intensive washing may offset some benefits. Conversely, an inexpensive route may support environmental benefits even when expensive identification hardware adds little. The direction of the comparison is not guaranteed. In an LCA of returnable e-commerce packaging, Park, Waqar and Snyder (2024) found that a returnable mailer had greater impact than a single-use alternative in nine of ten impact categories even after 40 reuse cycles, mainly because of transport distance. They also noted that rental and sale models can differ in return rates and non-return penalties. For the tertiary crates of interest here, a review of LCA studies of reusable plastic crates for fruit and vegetables reports generally favourable results. Those results depend on trip numbers, distances and washing assumptions (Gao et al., 2025).

6.2 Claims at the correct level

A paper may accurately conclude that a packaging system has a higher verified return fraction without making any statement about greenhouse-gas savings. It may establish that more returned units were fit for reuse without showing they subsequently served another delivery. It may model break-even reuse cycles under specified LCA assumptions without demonstrating that those cycles occurred. Betts et al. (2022) deliberately separate circularity metrics from impact metrics, and the distinction should carry through procurement dashboards, managerial claims and academic studies. Where environmental outcomes are reported, the functional unit, scope, geographical assumptions, cleaning, reverse logistics and end-of-life treatment should be explicit.

This separation is also a safeguard against indicator substitution. A procurement manager may be rewarded for purchasing returnable equipment while warehouse staff face an unmeasured collection backlog. A supplier may improve recovery-accounting quality before physical recovery improves, and both achievements can be real but different. For managerial transparency, circular procurement reports should present a small set of non-substitutable measures: due obligations, verified receipts, unresolved cases, serviceable units, realised cycles and, when independently modelled, environmental impacts. Summing them into one unqualified score risks obscuring the evidence chain.

7. Implications for Malaysian Food Supply Chains

7.1 Policy relevance without assuming implementation

Malaysia's Plastics Sustainability Roadmap 2021–2030 articulates a national direction towards plastics circularity (Ministry of Environment and Water, 2021). The Ministry's 2024 announcement of the Circular Economy Blueprint for Solid Waste 2025–2035 similarly orients policy towards material efficiency and stakeholder participation (Ministry of Housing and Local Government, 2024). These documents make the research question timely, but they do not furnish observations about the return performance of Malaysian food producers or distribution partners. This review accordingly makes no claim that a specific policy has increased crate returns or that any particular firm has implemented the proposed audit protocol.

The food-distribution context poses well-defined empirical questions. Packaging may circulate among producers, distributors, retailers, pooling firms and transport subcontractors; hygiene and damage inspection are relevant to whether a recovered unit can re-enter service. Seasonal shipment volume, delivery density and collection schedules can change both the number of due assets and the cost of recovering them. These are plausible features to measure, not quantified characteristics of a sampled Malaysian population in this review. In a supply-chain ranking of barriers to reusable packaging, concern about product safety ranked first, and return rates and timing were among the barriers assessed (Rane, Abhyankar, & Kirkire, 2025). Food-contact hygiene is therefore likely to shape which returned units count as reusable. Public-policy analysis should likewise distinguish returnable tertiary packaging from consumer-facing beverage deposit schemes, which may have different actors, payment rules and return points.

7.2 Governance and feasibility of a local evidence system

A Malaysian application could begin with a narrow, consensually defined asset cohort at each dyad. Both organisations would authorise aggregate transaction extraction, specify the custody event constituting a return and document their rights to correct disputes. Industry associations could assist recruitment, but the resulting sample would still need an explicit representativeness statement. A research team should seek multi-network participation, compare buyers' and suppliers' original records and record the share of obligations that remain unverified. Any observational analysis should adjust for deposit values, prior recovery, routes and collection frequency before interpreting a relationship between collaboration and physical returns.

The framework is deliberately compatible with heterogeneous information systems. High-cost asset-level tracking may be valuable where shrinkage is high or containers expensive, as analytical RTI models suggest (Kim & Glock, 2014). For lower-value or batch-tracked assets, a common ledger and disciplined reconciliation may be more feasible. The appropriate investment depends on the operating baseline and recovery economics. A meaningful decision therefore weighs the incremental quality of traceable, usable custody evidence against the available logistical and contractual alternatives. A simple choice between digitalising and not digitalising misses this.

8. Research Agenda and Testable Propositions

8.1 Move from perceptions to matched operational records

The first priority is to collect independent reports from buyers and suppliers and link them prospectively to return obligations, rather than ask one respondent to estimate environmental performance. Data-sharing quality should be recorded before the outcome window, with both the parties' viewpoints retained. A separate event log should describe exception resolution, and the return cohort should be frozen before analysis. This design would reduce single-informant common-method dependence and identify whether the ability to reconcile transactions changes during observation. It would not, without stronger identification, remove unobserved confounding or establish a causal mechanism.

A future study can distinguish at least two estimands: equal-weighted dyad-level verified return fractions and unit-weighted return fractions across all obligations. High-volume distributors will exert much greater influence on the second. The research question must determine the weighting, and the analysis should not move between these estimands without explanation. Missingness requires an additional comparison: high data-sharing scores might coincide with fewer unresolved events, making apparently superior return rates partly an ascertainment effect. Prespecified bounds and data-quality strata can reveal this possibility.

8.2 Discriminate against the strongest alternative explanations

A strong test should compare a governance-informed explanation with a concrete incentive-and-logistics model. Deposits, contractual liability, collection frequency, route length, packaging category, historical return experience and network structure are rival predictors. Observational indirect associations through joint problem-solving should be labelled as such; measuring a mediator at the same time as the predictor is inadequate for a causal mediation claim. Independent timing, intervention assignment or a plausible quasi-experimental change would be required before stronger language becomes defensible.

Table 3. Prioritised empirical tests derived from the review

Test	Proposed empirical contrast	Minimum evidence and interpretation
P1: operational linkage	Baseline data-sharing quality versus subsequent verified return fraction	Buyer/supplier surveys; matched due-return cohort; observational association
P2: reconciliation mechanism	Data exchange, documented exception closure and later returns	Time-stamped disputes, corrections and receipts; not automatic causal mediation
P3: complementary governance	Trust × data-quality association conditional on deposit and pickup policy	Independent baseline trust and contract/logistics records
P4: ascertainment test	Confirmed return and unresolved-event share reported together	Two-bound return estimates; no substitution of missing with zero
P5: alternative-explanation test	Governance model versus incentive/route-only benchmark	Identical dyad cohort, transparent performance and uncertainty
P6: impact separation	Verified returns versus documented reuse cycles and LCA impacts	Reuse-history and functional-unit inventory; outcomes reported separately

P1–P6 in Table 3 are prospective, falsifiable propositions distilled from the reviewed studies; they are not verified findings or registered hypotheses. A useful negative result would arise if buyer–supplier information sharing correlated with favourable self-reports but not with physically verified returns after controlling for incentives and ledger quality. An informative positive result would require stable bounds, beyond a single regression coefficient, across plausible choices of cohort cut-off, packaging class, dyad weighting and disputed custody status. Either outcome could help allocate managerial attention between data exchange, contracts and reverse logistics.

8.3 Research designs beyond one observational dyad survey

The research agenda can be extended in stages. A feasibility pilot should first verify whether two firms share a stable definition of packaging type, custody and due date. A matched prospective panel could then observe repeat cohorts with firm and network effects, recognising dependence between repeated units. A phased introduction of a shared reconciliation protocol, if operationally feasible and ethically acceptable, could provide stronger identification than a cross-sectional survey; staggered timing would still require checks for differential trends. Finally, pairing observed reuse histories with LCA would connect organisational mechanisms to environmental accounting without claiming that a return is inherently beneficial.

Research also needs deliberate scope comparisons. The effects of trust and ownership may differ between reusable pallets, foldable crates and food-contact containers. Small suppliers and anchor buyers may have unequal capacity to dispute a ledger, and pooling networks differ from one-to-one closed-loop return systems. Multi-country and Malaysia-specific comparisons can establish where transferable governance mechanisms meet different contracting, digital and transport conditions. Reviews of circular procurement or returnable packaging should therefore report asset and actor definitions as prominently as headline sustainability outcomes.

9. Discussion

The most important inference from this integration is methodological. Circular procurement, collaborative governance, RTI control and LCA are related but not interchangeable literatures. The first typically specifies organisational practice, the second explains coordination, the third models or manages physical asset flows, and the fourth estimates environmental consequences under a functional unit. A credible account of “closing the loop” requires explicit bridges across those units. Digital data sharing is a plausible bridge only if its records identify obligations and support authorised action; trust is a plausible facilitator only alongside a workable contract and collection system. None of these mechanisms by itself proves lower environmental impact.

The proposed return-obligation hierarchy makes those bridges empirically interrogable. A verified receipt measure provides a closer operational test than a generic green-performance score, while separating unverified custody cases prevents performance claims from being inflated by missing events. The hierarchy also prevents excessive narrowing. If a unit is returned but not serviceable, return performance and realised reuse should diverge. If reuse is achieved at high reverse-logistics cost, environmental accounting should remain separate. This approach treats measurement validity as part of supply-chain governance rather than only a statistical afterthought.

The strength of the present review is the explicit comparison of inference boundaries across several established research streams, including operational and environmental literatures. Its limits follow from the targeted approach: article identification was purposive, full-text access varied and selection was not an exhaustive multi-database systematic search. The source base includes modelling, reviews, surveys and policy documents whose findings cannot be pooled as one effect. The article therefore offers a reasoned synthesis and testable future research design, not an estimate of average treatment effects, a quantified national status assessment or confirmation of the proposed pathways.

10. Conclusions

Circular procurement can be evaluated more credibly when it is linked to due-date-defined packaging obligations and independently reconcilable physical returns. The reviewed literature suggests complementary roles for interoperable information, joint problem-solving, relational trust, contractual incentives and logistics controls; it does not identify one universally sufficient explanation. This article integrates those mechanisms into a framework that distinguishes verified return, reusability, realised reuse and life-cycle impact, with explicit allowance for missing custody evidence.

For Malaysian food supply chains, the immediate research opportunity is to build an auditable, shared measurement basis rather than to assume sustainability benefits. Such a basis would support tests that set supplier collaboration against financial and routing alternatives. That distinction offers a practical agenda for procurement managers and a sharper evidential standard for future circular-economy scholarship.

Acknowledgement

[Authors to insert verified funding and acknowledgement information, or state that the work received no specific funding.]

Data and Review Transparency Statement

This article is an integrative literature review and reports no new primary data or statistical effect estimates. The eligibility logic, indicative queries, source boundaries and limits are described in Section 2 and Appendix A. Public scholarly and official policy sources are identified in the references. The authors should verify final bibliographic metadata, permissions, institutional policies and any journal-required AI-use disclosure before submission.

Conflict of Interest

[Authors to confirm: “The authors declare no conflicts of interest.”]

Appendix A: Search transparency and evidence categories

This focused search and integrative synthesis was performed on 8 October 2026. The indicative search strings combined: (“circular procurement” AND performance); (“circular supply chain” AND information sharing); (“returnable transport item” AND tracking OR control); (“reusable packaging” AND reuse metrics); (“food packaging” AND life cycle assessment); and (“Malaysia” AND circular economy AND plastics). Queries were applied through web discovery of publicly indexed publisher, DOI and institutional records. Backward reference checking drew upon Xu et al. (2022), Glock (2017), Mahmoudi and Parviziomran (2020), Betts et al. (2022) and other cited reviews. Searches were not executed as one reproducible Scopus or Web of Science export; no deduplicated search-yield count is asserted.

Four types of evidence were retained: A, peer-reviewed empirical studies reporting organisational or case evidence; B, analytical or simulation work on RTI operating systems; C, scholarly reviews and conceptual contributions; D, official Malaysian policy material. The policy sources supply background only. Where full texts were unavailable, a publisher abstract or bibliographic record was used to establish the limited claim cited, not treated as detailed verification of unpublished methods or results. No study-level risk-of-bias score or pooled effect size was produced.

Appendix B: Suggested minimum ledger and reporting rules

Table A1. Essential fields for any future cross-company return audit

Field	Interpretation	Quality check
dyad_key	Pseudonymous buyer–supplier relationship	One focal asset category and consistent actor definition
asset_or_batch_key	Unit or traceable packaging batch	No duplicates across transaction lines
dispatch_event	Dated issue and receiving party	Source document and quantity unit retained
due_date	Agreed date obligation becomes due	Predeclared cut-off and grace rule
receipt_event	Matched evidence of physical custody return	Return point and source record available
reconciliation_code	Matched / unresolved / corrected / verified not returned	Both partner versions and adjustment history preserved
reuse_disposition	Inspected, serviceable, repaired or discarded	Distinct from the physical receipt outcome
reuse_event	Documented next issue/use after return	Required to claim realised reuse, not assumed

Recommended minimum reporting includes screened and consenting organisations, matched and unmatched relationships, all return-obligation denominators, the shares verified returned and unresolved, asset type, pickup frequency, deposit policy and observation window. If recycled rather than reused, that disposition belongs to a separate outcome. A future causal study must also establish the intervention timing, comparator construction and confounding assumptions. These rules are proposed research guidance rather than evidence of data collected for this review.

References

Accorsi, R., Cholette, S., Manzini, R., & Mucci, L. (2022). Managing uncertain inventories, washing, and transportation of reusable containers in food retailer supply chains. *Sustainable Production and Consumption, 31*, 331–345. doi:10.1016/j.spc.2022.02.014

Bag, S., Rahman, M. S., Gupta, S., & Jabbour, A. B. L. S. (2026). Artificial intelligence driven ethical procurement systems, circular economy and governance: A supplier performance analysis. *Journal of Purchasing and Supply Management, 32*(3), 101075. doi:10.1016/j.pursup.2025.101075

Betts, K., Gutierrez-Franco, E., & Ponce-Cueto, E. (2022). Key metrics to measure the performance and impact of reusable packaging in circular supply chains. Frontiers in Sustainability, 3, 910215. doi:10.3389/frsus.2022.910215

Breen, L. (2006). Give me back my empties or else! A preliminary analysis of customer compliance in reverse logistics practices (UK). Management Research News, 29(9), 532–551. doi:10.1108/01409170610708989

Cao, M., & Zhang, Q. (2011). Supply chain collaboration: Impact on collaborative advantage and firm performance. Journal of Operations Management, 29(3), 163–180. doi:10.1016/j.jom.2010.12.008

Coelho, P. M., Corona, B., ten Klooster, R., & Worrell, E. (2020). Sustainability of reusable packaging—Current situation and trends. Resources, Conservation & Recycling: X, 6, 100037. doi:10.1016/j.rcrx.2020.100037

Cottafava, D., Brussa, G., Cavenago, G., Cespi, D., Rigamonti, L., Bala, A., ... Sazdovski, I. (2024). Requirements for comparative life cycle assessment studies for single-use and reusable packaging and products: Recommendation for decision- and policy-makers. The International Journal of Life Cycle Assessment, 29(5), 909–911. doi:10.1007/s11367-024-02291-0

Dang, L. T. A., Duong, Q. H., Zhou, L., & Meng, M. (2026). Resilience in closed-loop supply chain: A systematic literature review. Industrial Management & Data Systems. Advance online publication. doi:10.1108/IMDS-04-2025-0557

Dyer, J. H., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. Academy of Management Review, 23(4), 660–679. doi:10.5465/amr.1998.1255632

Espinoza-Orias, N., & Lundquist, L. (2025). Life cycle assessment of reusable food and beverage packaging systems: A proposal of good practice. Journal of Cleaner Production, 499, 145207. doi:10.1016/j.jclepro.2025.145207

Farooque, M., Zhang, A., Choi, T.-M., Hartley, J. L., & Liu, Y. (2024). Antecedents and performance outcomes of circular procurement: An empirical study in China. Journal of Purchasing and Supply Management, 30(4), 100882. doi:10.1016/j.pursup.2023.100882

Farooque, M., Zhang, A., Thürer, M., Qu, T., & Huisingh, D. (2019). Circular supply chain management: A definition and structured literature review. Journal of Cleaner Production, 228, 882–900. doi:10.1016/j.jclepro.2019.04.303

Gao, S., Yao, J., Zhao, X., Ren, P., Gustavsson, M., & Wu, C. (2025). Review on life cycle analysis (LCA) studies of reusable plastic crates for fruit and vegetables. *International Journal of Sustainable Engineering, 18*(1), 2457345. doi:10.1080/19397038.2025.2457345

Glock, C. H. (2017). Decision support models for managing returnable transport items in supply chains: A systematic literature review. International Journal of Production Economics, 183, 561–569. doi:10.1016/j.ijpe.2016.02.015

Grimm, C. (2025). Unraveling circular conundrums with a cheeky twist: Proposal for a new way of measuring circular economy efforts at the product level within procurement-to-waste system boundaries—A case study from the airline industry. Sustainability, 17(3), 807. doi:10.3390/su17030807

Hellström, D., & Johansson, O. (2010). The impact of control strategies on the management of returnable transport items. Transportation Research Part E: Logistics and Transportation Review, 46(6), 1128–1139. doi:10.1016/j.tre.2010.05.006

Hemachandra, S., Hadjikakou, M., & Pettigrew, S. (2024). A scoping review of food packaging life cycle assessments that account for packaging-related food waste. The International Journal of Life Cycle Assessment, 29, 1899–1915. doi:10.1007/s11367-024-02349-z

Jäger-Roschko, M., & Petersen, M. (2022). Advancing the circular economy through information sharing: A systematic literature review. Journal of Cleaner Production, 369, 133210. doi:10.1016/j.jclepro.2022.133210

Karmaker, C. L., Al Aziz, R., Ahmed, T., Misbauddin, S. M., & Moktadir, M. A. (2023). Impact of industry 4.0 technologies on sustainable supply chain performance: The mediating role of green supply chain management practices and circular economy. Journal of Cleaner Production, 419, 138249. doi:10.1016/j.jclepro.2023.138249

Kim, T., & Glock, C. H. (2014). On the use of RFID in the management of reusable containers in closed-loop supply chains under stochastic container return quantities. Transportation Research Part E: Logistics and Transportation Review, 64, 12–27. doi:10.1016/j.tre.2014.01.011

Kim, T., Glock, C. H., & Kwon, Y. (2014). A closed-loop supply chain for deteriorating products under stochastic container return times. Omega, 43, 30–40. doi:10.1016/j.omega.2013.06.002

Kristensen, H. S., & Mosgaard, M. A. (2020). A review of micro level indicators for a circular economy—Moving away from the three dimensions of sustainability? Journal of Cleaner Production, 243, 118531. doi:10.1016/j.jclepro.2019.118531

Kudrenko, I., & Hall, L. (2025). Adoption of reusable transit packaging in US industries: A framework for enhanced sustainability. *Review of Managerial Science, 19*(9), 2633–2666. doi:10.1007/s11846-024-00826-1

Lee, S. Y., Hu, J., & Lim, M. K. (2024). Revisiting circular economy indicators: A circular supply chain perspective. Journal of Purchasing and Supply Management, 30(4), 100941. doi:10.1016/j.pursup.2024.100941

Mahmoudi, M., & Parviziomran, I. (2020). Reusable packaging in supply chains: A review of environmental and economic impacts, logistics system designs, and operations management. International Journal of Production Economics, 228, 107730. doi:10.1016/j.ijpe.2020.107730

Ministry of Environment and Water. (2021). Malaysia plastics sustainability roadmap 2021–2030. Retrieved October 8, 2026, from https://www.nres.gov.my/ms-my/pustakamedia/Penerbitan/MALAYSIA%20PLASTICS%20SUSTAINABILITY%20ROADMAP%202021-2030.pdf

Ministry of Housing and Local Government. (2024). Launch of the circular economy blueprint for solid waste [Media release]. Retrieved October 8, 2026, from https://www.kpkt.gov.my/kpkt/resources/user_1/media_akhbar/2024/SM_BLUEPRINT_EKONOMI_KITARAN.pdf

Park, J., Waqar, Z., & Snyder, W. R. (2024). Environmental analysis of returnable packaging systems in different eCommerce business and packaging management models. *Journal of Industrial Ecology, 28*(6), 1493–1506. doi:10.1111/jiec.13537

Poppo, L., & Zenger, T. (2002). Do formal contracts and relational governance function as substitutes or complements? Strategic Management Journal, 23(8), 707–725. doi:10.1002/smj.249

Raible, I. M., Holweg, C., Reiner, G., & Teller, C. (2024). Returnable packaging systems and store operations: Processes, costs, and benefits. *Journal of Industrial Ecology, 28*(3), 439–454. doi:10.1111/jiec.13477

Rane, S. B., Abhyankar, G. J., & Kirkire, M. S. (2025). Barriers to adoption of reusable packaging from supply chain perspective: Multi criteria decision making analysis and industry 4.0 strategies. *OPSEARCH, 63*(1), 445–496. doi:10.1007/s12597-024-00900-y

Rouhani, S., Wardley, L. J., & Hassanzadeh Amin, S. (2025). A comprehensive survey into reverse logistics and closed-loop supply chain aspects to provide analyses and insights for implementation. Journal of Cleaner Production, 490, 144743. doi:10.1016/j.jclepro.2025.144743

Seuring, S., & Gold, S. (2012). Conducting content-analysis based literature reviews in supply chain management. Supply Chain Management: An International Journal, 17(5), 544–555. doi:10.1108/13598541211258609

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104, 333–339. doi:10.1016/j.jbusres.2019.07.039

Trevisan, C., Bortoluzzi, D., Formentini, M., & Ellram, L. M. (2025). From resource dependence to embeddedness: How the circular economy reshapes power and dependence dynamics in buyer–supplier relationships. *International Journal of Operations & Production Management, 45*(13), 266–293. doi:10.1108/IJOPM-01-2025-0077

Wang, Q., Liu, X., Huo, B., & Zhao, X. (2023). Economic or relational first? Establishing the competitiveness of third-party logistics information sharing by devoting specific assets and mutual trust. International Journal of Production Economics, 261, 108869. doi:10.1016/j.ijpe.2023.108869

Xu, L., Jia, F., Yan, F., & Chen, L. (2022). Circular procurement: A systematic literature review. Journal of Cleaner Production, 365, 132845. doi:10.1016/j.jclepro.2022.132845

Yadav, P., Silvenius, F., Katajajuuri, J.-M., & Leinonen, I. (2024). Life cycle assessment of reusable plastic food packaging. Journal of Cleaner Production, 448, 141529. doi:10.1016/j.jclepro.2024.141529

Zhang, A., & Seuring, S. (2024). Digital product passport for sustainable and circular supply chain management: A structured review of use cases. International Journal of Logistics Research and Applications, 27(12), 2513–2540. doi:10.1080/13675567.2024.2374256