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The Impact of Green Supply Chain on Organizational Performance

School of Management
Strategic Business Development

VAASA 2025

UNIVERSITY OF VAASA
School of Management
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Degree: Master's Degree in Business studies
Department: Department of Management
Major Subject: Strategic Business Development
Year of Completing the Master's Thesis: 2025 **Pages:112**

ABSTRACT

This paper explores how Green Supply Chain Management (GSCM) practices affect organizational performance in Bangladeshi garment industry. Based on Natural Resource-Based View, Institutional Theory and Diffusion of Innovation, the study explores how environmental initiatives function in contexts and produce environmental, operational and economic benefits. The qualitative multiple case design was based on the four semi-structured interviews between two garment manufacturers, and three in each category, with different ownership and sustainability maturity. As discussed, there are two directions with dominant patterns that emerge: the capability driven model, where internal systems and eco-design drive efficient and cost-savings; the buyer driven model, where institutional pressures and collaborative programs foster compliance and reputation. This study demonstrated that environmental and operational improvements help the connection between the GSCM–performance relationship and modifyrators such as digital enablement, strategic fit and buyer support for increased results. This research provides mechanisms-based explanations from an emerging economies perspective and leadership for aligning sustainability with competitive strategy to be included in the literature of GSCM. Overall, the findings are that green practices can provide long-term value as embedded in core operations and supported by institutional collaboration.

KEYWORDS: Green Supply Chain Management (GSCM), Environmental Performance, Operational Efficiency, Institutional Pressure, Diffusion, Garment Industry, Bangladesh

LIST OF FIGURES

1. INTRODUCTION

This chapter includes a complete introduction to the research as well as a background on Green Supply Chain Management (GSCM) and its impact on organizational performance. It depicts the main research question and provides the motivation to investigate the role of GSCM on economic, environmental and social aspects of sustainability. It ends by providing the overall structure of the thesis.

1.1. Background

Green Supply Chain Management (GSCM) has emerged as a strategic necessity for organizations aiming to address rising environmental concerns while maintaining strong organizational performance. In today's globalized and environmentally conscious market, GSCM integrates environmental thinking into all aspects of the supply chain, including product design, material sourcing, manufacturing processes, delivery, and end-of-life product management (Sarkis et al., 2011)

What this thesis means by GSC vs. GCM. This study provides an overview of green supply chain; GSC is a eco-oriented configuration of flows throughout product life-cycle, design sourcing, manufacturing, distribution, use and end-of-life recovery. Green Supply Chain Management , or GSCM, refers to managerial practices and inter-firm processes that plan, implement, and improve this eco-oriented configuration, such as internal environmental management, green purchasing/supplier collaboration, eco-design, customer collaboration, and reverse logistics. Classic reviews and recent reviews identify a set of practices, end-to-end scope, closed loop flows under the umbrella of SSCM.

Why it matters to Bangladesh's garment industry. Consumer credit ratings, certifications and audit programs of the export-oriented apparel companies are increasingly demanding credible environmental performance. This data suggests that when firms take coherent GSCM bundles, environmental and operational performance gains are usually first gained initially but may then become economic/reputational benefits (e.g. lower waste/energy intensity, less defects, poorer throughput) whereas their improvement can then produce and then lag to economic/reputational effects (e.g. costs reduction, tender access, preferred-supplier status). Meta-analysis supports a average positive business case for E)SSCM and sector/region and practice mix describe the difference in payoffs and this is relevant to Bangladesh's buyer-driven context.

The Green Supply Chain Management (GSCM) is a philosophy that emphasizes environmental thinking in the design of products, materials selection, manufacture, logistics

and end-of-life management. Bangladesh's garment sector is the second-largest exporter in the world and is a vital economic hub for the nation, but now faces the threat of global buyers to deshownvironmental responsibility and operational efficiency. Many local manufacturers are struggling to connect these green requirements with everyday operations and performance enhancements, while big brands such as H&M and Zara have adopted strict environmental standards.

Various scholars have highlighted that GSCM is no longer a peripheral concern but central to business performance. It not only helps reduce environmental degradation but also strengthens a firm's competitive position and financial outcomes. According to empirical studies, key GSCM practices such as internal environmental management, green purchasing, eco-design, cooperation with customers, and investment recovery significantly contribute to operational, environmental, and economic performance dimensions (Sahoo & Vijayvargy, 2021)

The relevance of GSCM extends beyond environmental compliance; it supports business growth by increasing energy efficiency, reducing production waste, and fostering innovation through green initiatives. Evidence suggests that organizations adopting GSCM practices experience improvements in customer satisfaction, resource utilization, and market share, thereby enhancing their overall organizational performance (Gelmez et al., 2024) .

Moreover, the integration of digital technologies in supply chain operations — such as big data analytics, Internet of Things (IoT), and cloud-based platforms — enhances real-time tracking, predictive maintenance, and energy optimization, which are crucial in promoting sustainability and operational efficiency (Zhang et al., 2025) .

GSCM can also contribute to the transition to a circular economy by encouraging reusability, recycling, or product retention and enhancement . This will ensure that the company does meet environmental compliance but also "sustainable profitability and trust from the stakeholders".

Past research has shown that GSCM can reduce pollution and improve resource efficiency (Zhu & Sarkis, 2006; Seuring & Müller, 2008), but empirical understanding of *how* these practices create value in developing-country contexts remains limited. This study addresses that gap by examining Bangladeshi garment manufacturers through the lenses of the Natural Resource-Based View (NRBV), Institutional Theory, and Diffusion of Innovation.

1.2. Motivation for the study

Motivation from management. For Bangladeshi garment workers, green practices are often called on and what they achieve when they adopt them as part of their work beyond compliance. The strongest evidence to date shows that a coherent bundle (IEM, supplier/customer collaboration, eco-design, reverse logistics) can improve EP/OP first; conversion into economic/market outcome depends on context, maturity, and measurement credibility. This allows management to draw the form of a qualitative, mechanism-tracing view to the task of sequentially investing and justifying returns with a qualitative perspective.

Scholarly motivation. Aggregated results suggest that "green pays on average" and effects differ across industries/regions and practices. Previous work suggests reporting results in three buckets (market, operational, accounting) and studying conditions (institutional pressure, strategy fit, digital enablement) affecting or weakening conversion from EP/OP into economic data. The comparative, multiple-case design can close this gap by showing the conceptualization of mechanisms, and when they translate into economic or reputational outcomes.

Also, previous research frequently assumes GSCM a set of practice purely consistent, and without contextual differences such as ownership structure, digital enabling, or strategic fit. This thesis thus seeks to explore how companies implement specific GSCM practices and why it is done so and how these may translate to performance improvement.

Immediate gap identified. We provide strong aggregate evidence to show (i) how specific GSCM practices within Bangladeshi garment firms generate environmental/operational improvements, and (ii) by which context conditions, institutional/buyer pressure, strategic fit, green-IS/digital enablement, do not relate to mechanisms at macrolevel to developing countries. They do economic or reputationally benefit from the improvement. This study addresses this gap using comparative internal-case and cross-case analysis with results in market/operational/accounting buckets for comparison to quantitative literature.

1.3. Research Question

Building on the Background and the literature on Green Supply Chain Management (GSCM), this thesis examines how and under what conditions GSCM practices translate into multi-dimensional organizational performance. Prior evidence suggests that performance benefits often materialize indirectly through environmental and operational improvements (Green et al., 2012; Golicic & Smith, 2013), while adoption and impact vary with institutional pressures, strategic fit, legitimacy concerns, and digital integration (Seuring & Müller, 2008;

Zhu, Sarkis & Lai, 2012; Laari, Töyli & Ojala, 2018). Against this backdrop, the study is guided by the following questions.

RQ1: How do Bangladeshi garment manufacturers implement key GSCM practices (internal environmental management, eco-design, supplier and customer collaboration, and reverse logistics), and what mechanisms do managers report that link these practices to environmental and operational improvements?

RQ2: Under what contextual conditions (e.g., institutional/buyer pressure, strategic fit, digital enablement) do these mechanisms translate into economic or reputational outcomes, and when are they strengthened or weakened?

Design fit. This thesis uses an inductive, comparative, multiple-case design with mechanisms (praxis EP/OP economic/reputational) and conditions (institutional pressure, strategy fit, digital/measurement enablement) to test a speed or stall conversion.

Overall Aim**:** To investigate how key GSCM practices contribute to environmental, operational, and economic performance in Bangladeshi garment manufacturing firms, and under what conditions these links are strengthened or weakened

1.4. Structure of Thesis

The thesis is divided into five chapters to ensure that the ideas are logical and coherent.

Chapter One, introducing the research topic, is provided in Chapter 1, where it discusses background, problem description, gap, goals and research questions. It also presents the theoretical views under which the work is based and explains its practical significance for Bangladeshi garment industry.

Chapter Two provides a brief overview of the literature in Green Supply Chain Management (GSCM), explaining how Green Supply Chain Management is theoretically grounded under Sustainable Supply Chain Management (SSCM). A discussion of the main theoretical lenses of NRBV, Institutional Theory and Diffusion/Ecological Modernization leads to the conceptual gaps that describe the work done here.

Chapter Three explains the methodology utilized. This paper outlines the qualitative multiple-case study design, case and participant selection criteria, data collection process, coding, and analytical practices. This chapter also discusses the validity, reliability, and ethical implications of research.

Chapter four presents empirical data and cross-case data from two garment manufacturers, demonstrating GSCM practices and mechanisms of interconnection to environmental, operational and economic performance. Comparative tables, figures and direct quotes from participants further refine and enrich the analysis.

Chapter Five examines results with respect to existing theories, both theoretical and managerial implications. It concludes with the limitations of the research and the directions for future research and a reflection of the role of GSCM in the sustainable competitiveness in Bangladesh‘s garment industry.

2. LITERATURE REVIEW

This chapter looks at what earlier studies say about green supply chain management (GSCM) and how it relates to organizational performance. It explains the main ideas in simple terms—what GSCM is, what its key practices are (like green purchasing, eco-design, collaboration with partners, and reverse logistics), and how these practices can improve environmental and business results. Using academic articles and relevant industry reports, the chapter sums up what is already known, points out where the findings still disagree or are incomplete, and shows what is missing in the current research. Based on this review, it sets up the theoretical framework for the thesis and clearly highlights the research gap that the later chapters will address.

2.1. Green Supply Chain

A green supply chain means running the whole supply chain with the environment in mind—from how a product is designed and materials are sourced, through manufacturing and distribution, to use and end-of-life (take-back, reuse, remanufacturing, recycling, or safe disposal). Classic studies describe this as adding environmental goals to everyday supply decisions and relationships across firms, not treating them as an afterthought (Sarkis, 2003; Srivastava, 2007; Beamon, 1999). Common elements repeat across the literature: a bundle of practices (e.g., green purchasing, eco-design, cleaner production/marketing, and reverse logistics), end-to-end/life-cycle scope, and an emphasis on closed-loop flows that return materials to productive use (Hervani et al., 2005; Zhu & Sarkis, 2006; Kumar & Putnam, 2008). Recent reviews also note the role of measuring and improving environmental performance with suppliers and customers along the chain (Seuring & Müller, 2008; Zsidisin & Siferd, 2001).

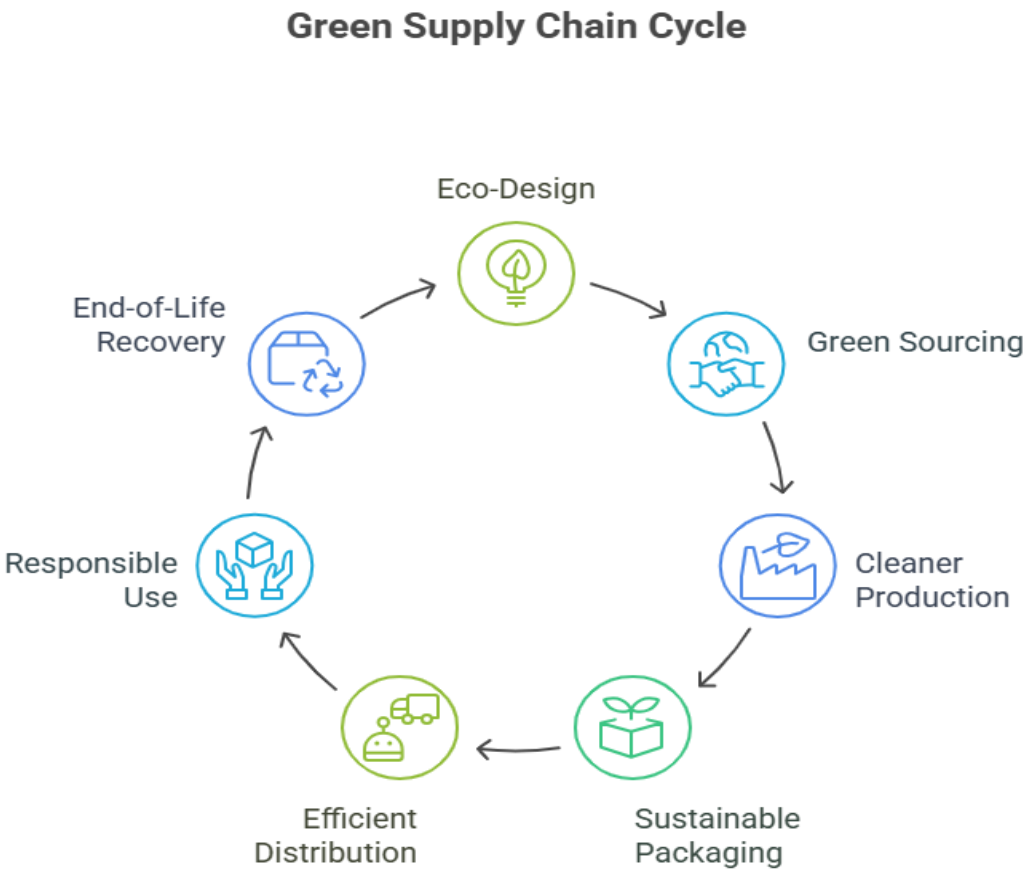


Figure 1.Green Supply Chain Cycle (Author's own work)

2.1.1. Working definition used in this thesis:

Green Supply Chain (GSC) is the integration of environmental thinking into supply chain decisions and relationships across the entire product life cycle—covering design, supplier selection and sourcing, manufacturing, packaging and distribution, use, and end-of-life recovery (reuse, remanufacturing, recycling, safe disposal)—with the goals of reducing resource use and emissions, minimizing waste, and building closed-loop flows that also support organizational performance (Beamon, 1999; Sarkis, 2003; Hervani et al., 2005; Srivastava, 2007; Zhu & Sarkis, 2006; Kumar & Putnam, 2008; Seuring & Müller, 2008).

2.1.2. Definition map (GSC/GSCM)

Source	Concise definition (paraphrased)	Scope keywords
Beamon (1999)	Extends traditional supply chain to minimize environmental impact across the life cycle; emphasizes green design, resource saving, reduction of harmful materials, recycle & reuse.	Life-cycle; green design; resource-saving; recycle/reuse
Sarkis (2003)	Integrates environmental goals into supply decisions & relationships; strategic decision framework for GSCM.	Integration into decisions; cross-firm relationships; strategy lens
Hervani, Helms & Sarkis (2005)	Bundles practices: green purchasing, environmental production/marketing, reverse logistics; focuses on performance measurement.	Practice bundle; reverse logistics; performance metrics
Srivastava (2007)	State-of-the-art review: GSCM integrates environmental thinking across design, sourcing, manufacturing, distribution, and reverse flows.	Integrated life-cycle scope; reverse flows
Zhu & Sarkis (2006)	Drivers and practices across sectors; clarifies upstream/downstream collaboration as core to GSCM.	Upstream & downstream collaboration; drivers
Kumar & Putnam (2008)	Shift from “cradle-to-grave” to “cradle-to-cradle”; reverse logistics strategies across industries.	Closed-loop; cradle-to-cradle; RL strategies
Seuring & Müller (2008)	Positions GSCM within sustainable SCM; emphasizes supplier management & product sustainability across life cycle.	SSCM umbrella; supplier mgmt; sustainable products

Zsidisin & Siferd (2001)	Environmental purchasing framework: reduce–reuse–recycle–substitute in acquisition decisions.	Environmental purchasing; 4R logic

Table 1 Definition map (GSC/GSCM)

2.2. Theoretical Lenses (Why/How for RQ1–RQ2)

This subsection explains why and how green supply chain management (GSCM) should affect performance in this study. Four complementary lenses—natural-resource-based view (NRBV) and capabilities, institutional theory, diffusion/ecological modernization, and the sustainable supply chain management (SSCM) umbrella—justify the mediated pathways, conditions, and outcome scope in RQs 1–2 (Hart, 1995; DiMaggio & Powell, 2000; Zhu, Sarkis & Lai, 2012; Seuring & Müller, 2008).

2.2.1. NRBV / Capabilities — *Why practices yield improvements (mechanisms for RQ1)*

The NRBV argues that firms build advantage by developing capabilities that prevent pollution, steward products across the life cycle, and enable cleaner development. In GSCM, these capabilities appear as internal environmental management, eco-design, supplier and customer collaboration, and reverse logistics. Empirical models typically find an indirect performance pathway: practices first improve environmental and operational performance (e.g., lower emissions, fewer defects, better throughput) and then translate into economic results—the mediated logic we trace in this thesis (Hart, 1995; Teece, Pisano & Shuen, 1997; Green et al., 2012). From a Natural Resource-Based View, firms develop valuable, rare, and hard-to-imitate environmental capabilities that raise process efficiency and resource productivity. In a GSCM bundle, IEM, eco-design, collaboration, and reverse logistics function as capability routines that first improve environmental performance (emissions, waste, energy/water intensity) and operational performance (yield/FPY↑, defects↓, cycle time↓, unit cost↓). Empirical evidence shows these EP/OP gains mediate GSCM's link to financial results—so the business case is mainly indirect (Feng et al., 2018; Golicic & Smith, 2013).

2.2.2. Institutional pressures & ecological modernization — *When mechanisms convert (boundary conditions for RQ2)*

Institutional theory explains adoption via coercive (regulators and powerful buyers), mimetic (copying leaders), and normative (professional standards) pressures. This lens clarifies why some firms are early adopters while others wait, and it motivates conditions such as regulatory stringency or customer pressure in the framework (DiMaggio & Powell, 2000; Zhu, Sarkis & Lai, 2012). In export apparel chains, buyer requirements, certification regimes, and disclosure norms legitimize claims and tighten the link from EP/OP improvements to tenders won, preferred status, and risk reduction (Zhu et al., 2012; Sarkis, Zhu, & Lai, 2011). Expect stronger conversion when pressure and verification are high; weaker when enforcement/legitimacy is low. In cross-case synthesis, compare pressure profiles (audits, codes, certification scope) to explain differences in conversion (Zhu et al., 2012; Sarkis et al., 2011).

2.2.3. Diffusion and Ecological Modernization

Diffusion logic views GSCM as an innovation that spreads through industries and regions, supported by regulation, market signals, and internal capabilities. Adoption trajectories (early vs. late) and capability maturity help explain heterogeneity in outcomes and time lags. This lens justifies attention to context and timing effects in the framework and supports qualitative tracing of adoption pathways (Zhu, Sarkis & Lai, 2012). Seeing GSCM as a diffusing innovation highlights adoption stage (pilot → routinized → scaled) and maturity as explanations for how firms implement (RQ1) and how fast EP/OP gains convert (RQ2). Early adopters may gain reputation/market access advantages but face setup costs; late adopters copy routines but often convert slower without deep learning. Code maturity levels by practice and look for sequencing (IEM/data systems before collaboration; collaboration before reverse flows), then relate maturity to conversion speed (Zhu et al., 2012).

2.2.4. Positioning GSCM under the SSCM Umbrella

Sustainable Supply Chain Management (SSCM) is a broad concept that integrates environmental, economic/financial, operational, and social dimensions into supply chain decision-making and coordination (Seuring & Müller, 2008). Within this framework, Green Supply Chain Management (GSCM) represents the environmental pillar, focusing specifically on minimizing ecological impacts through practices such as eco-design, internal environmental management, supplier and customer collaboration, and reverse logistics.

Positioning GSCM under the SSCM umbrella serves two important purposes in this thesis. First, it clarifies the outcome space: while SSCM considers all three pillars of sustainability, this study primarily examines how environmental practices in supply chains influence environmental, operational, and economic/financial performance, with social outcomes considered where relevant. Second, it highlights the life-cycle orientation and closed-loop scope of GSCM, which goes beyond individual firms to require active collaboration across supply chain partners.

This positioning underscores that GSCM is not an isolated construct but part of a larger sustainability framework. It also justifies the thesis design, which investigates how environmental practices diffuse across supply chains and how their performance impacts are mediated by internal capabilities and moderated by institutional pressures. In this way, the study situates GSCM as both a specialized domain within SSCM and a critical driver of broader sustainable performance outcomes. (Seuring & Müller, 2008, pp. 1700–1718)

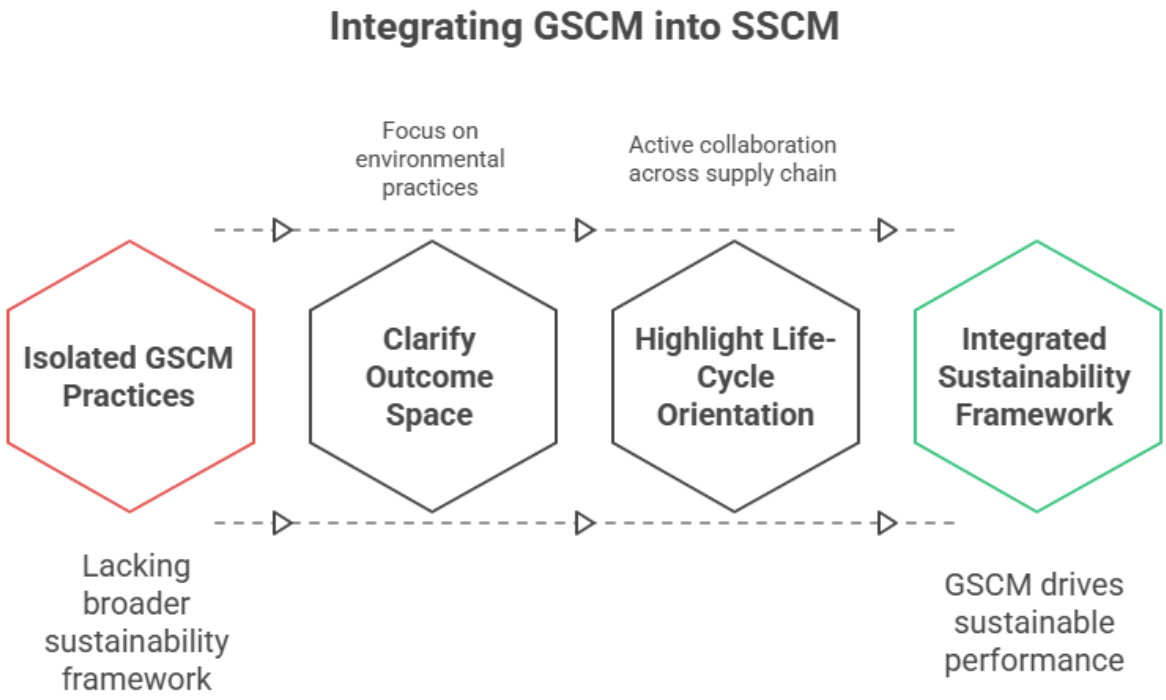


Figure 2 Integrating GSCM into SSCM (Author's own work)

2.2.5. How these lenses support RQs 1–2

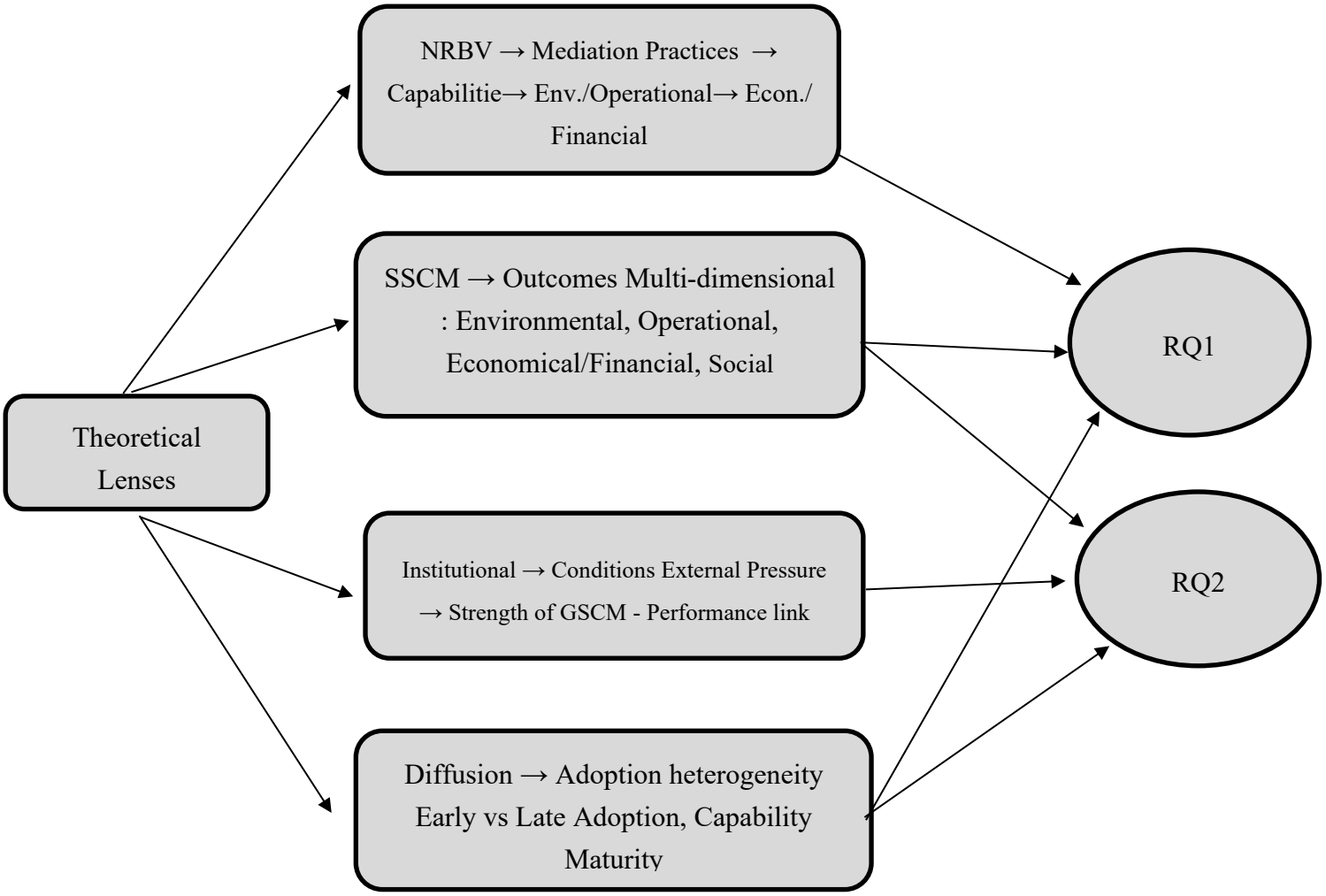


Figure 3 Theoretical Lenses support RQ (Author's own work)

2.2.6. Theoretical lenses, what they explain, metrics to look for, and implications for RQs

Lens	Explains (why/how)	What to look for in data (examples)	Implications for RQs
NRBV / capabilities	How green capabilities (pollution prevention, product stewardship) create value via process/product improvements.	ISO-14001/EMS, eco-design initiatives, defect/emission reductions preceding financial metrics.	Justifies mediation GSCM → Env/Op → Econ (RQ1).
Institutional theory	Why firms adopt under coercive, mimetic, normative pressures.	Mentions of regulation, buyer requirements, industry certifications; references to competitors' practices.	Explains conditions (pressure strength) and adoption depth (RQ2).
Diffusion / ecological modernization	How practices spread and yield improvement over time as capabilities mature.	Early vs. late adoption language; time since first green initiatives; capability maturity cues.	Supports context/timing effects and heterogeneity (RQ1,RQ2).
SSCM umbrella	Positions environmental focus within broader sustainability to scope outcomes.	Evidence spanning environmental, operational, economic/financial, and social metrics.	Justifies multi-dimensional outcomes (RQ1,RQ2).

Table 2 Theoretical Lenses

2.3. GSCM Practice Dimensions & Measures (feeds RQ2)

This section clarifies the green supply chain management (GSCM) practice dimensions used in the thesis and how each is typically measured in empirical studies. We adopt a widely used bundle—internal environmental management (IEM), green purchasing/supplier collaboration, eco-design (product stewardship), customer collaboration, and reverse logistics/investment recovery—because these constructs appear consistently across validated

scales and systematic reviews (Green et al., 2012; Govindan et al., 2015; Hervani et al., 2005; Zhu & Sarkis, 2006). Where helpful, we also note what to capture in interviews and secondary data so your mixed evidence aligns with survey-based measures.

2.3.1. Internal Environmental Management (IEM)

The organizational core of GSCM is Internal Environmental Management (IEM). It shows evidence of the way firms develop architectures, routines and cultures that incorporate sustainability in their everyday operations. Among these are commitment at the top-executive level (establishing strategic environmental protection priorities), well defined objectives and performance measures, regular environmental assessments, cross-functional cooperation between purchasing, manufacturing, and distribution, employee training programs, and formalized systems such as Environmental Management Systems (EMS) and ISO 14001 certifications (Hervani, et al., 2005; Crutchley, et al. 2005; Green, et al. 2012). The combination of these attributes is that environmental initiatives are not just here-and-there; firms have developed the capacity to give them systems of operation allowing them to pull their supply chain partners under a unified vision of sustainability .
Governance: To whom do the environmental targets belong top management, sustainability officers, functional heads.? Routines: How are audits conducted, and what corrective action processes exist?Resources: What financial, personnel and training resources are dedicated to environmental programs?

In secondary data, ISO 14001 certification status, extent of the EMS implemented, and public reporting on goals and progress related to various issues such as carbon reduction, waste reduction, or energy efficiency should be noted by the researcher.

Anchor (IEM). Internal environmental management is the backbone capability that coordinates targets, audits, training, and Green-IS for measurement; studies show it reliably precedes and enables external practices. (Green et al., 2012; Seuring & Müller, 2008).

2.3.2. Green Purchasing / Supplier Collaboration

Green purchasing and supplier collaboration means the inclusion of environmental considerations in the sourcing and supplier management processes. This particular dimension of GSCM focuses on compliance and partnerships. On the compliance end, companies ask suppliers to comply with minimum environmental standards, have certifications (such as ISO 14001), and to pass environmental audits. On the partnership end, companies involve suppliers in joint development efforts such as material substitution (e.g. replacing hazardous materials with green ones), process development efforts, and upstream disclosure of environmental performance (Zsidisin and Siferd, 2001; Zhu and Sarkis, 2006; Green et al., 2012). Effective green purchasing thus moves beyond monitoring of transactions and toward collaboration on relationships that fosters long term capability improvements along the supply chain.

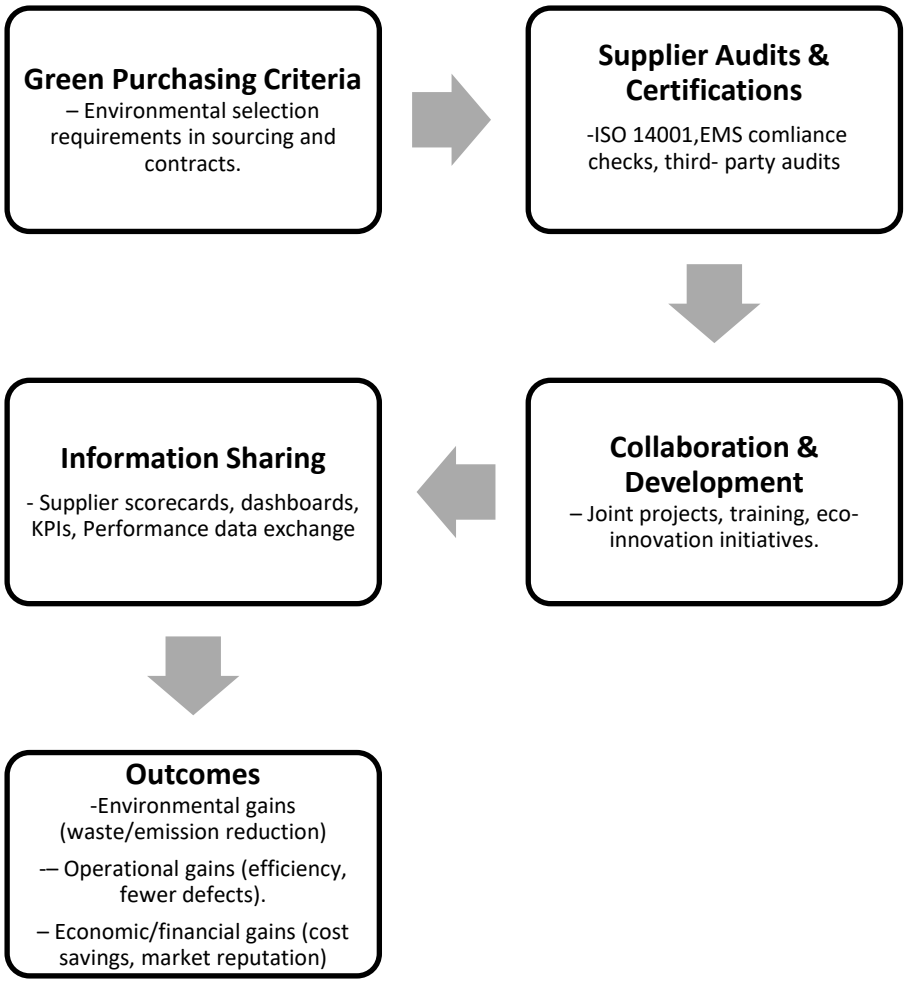


Figure 4 Green Purchasing and Supplier Collaboration Pathway (Author's own work)

Sample probes in interviews can include: Supplier selection gates: What are non-negotiable criteria (ISO 14001, REACH, RoHS compliance?) Audit process: Frequency of audits to suppliers. What alternative action processes are followed? Collaborations structure: Are there joint kaizen, ko-innovation or training projects? Information sharing: How do firms and suppliers exchange environmental data (dashboards, supplier portals, scorecards)? Alternative secondary data that can be useful includes percentage of suppliers with EMS certifications, audit frequency, sustainability requirements for suppliers, and templates/reports.

Anchor (Supplier/Green purchasing). Upstream collaboration and environmental purchasing spread process changes to suppliers—reducing defects, scrap, and energy intensity that later show up in operational metrics. (Green et al., 2012; Seuring & Müller, 2008).

2.3.3. Eco-design / Product Stewardship

Eco-design, commonly known as product stewardship, is the incorporation of environmental concerns directly into the design and development of products and packaging. The objective is to minimize environmental loads on the environment at all stages, from raw material acquisition to manufacturing all the way through distribution, utilization and disposal (Hervani et al., 2005; Zhu & Sarkis, 2006). Eco-design is the integration of the factors of sustainability as a design parameter, rather than just doing products which are cheap, functional and appealing to the consumer, eco-design opposes a set of competitive requirements such as function versus performance and costs versus affordability with ecological minimization.

Eco-design measures at the level of products are:

Material efficiency – minimizing the amount of raw materials and increasing the renewable or recycled content (i.e. bio-based plastics, closed-loop metals) .

Energy efficiency-producing products that draw less energy during the use phase, which is typically the most significant in terms of environmental impact in electronics and appliances.

Hazardous-substance elimination- eliminating hazardous substances (lead, mercury, halogenated flame retardants, phthalates) in accordance to the REACH/RoHS recommendations.

Design for disassembly/recyclability - modular design, standardization of fasteners, materials clearly labeled to allow for repair, remanufacture, and recycling better.

Packaging, redesign - downweighting and downsizing (e.g. flat-pack solutions) replacing single use materials with recyclable or compostable materials, reduce emissions producing/transporting.

Extended product responsibility - as companies calibrate processes for post-use gathering, recovering, recycling that connect eco- design with reverse logistics and circular economy procedures.

On a process level, eco-design is facilitated by life cycle assessment tools such as SimaPro and GaBi, which can reveal the impacts of designing something in different ways, and help firms select materials or processes with lower impacts. Eco-labels and certifications (e.g. Energy Star, EU Ecolabel, FSC, EPEAT) also help companies signal that they are meeting environmental benchmarks, assuage their customers, and segment themselves in the marketplace.

The ulterior eco-design represents a process that spans over the borders of the firm as it implies suppliers (of green materials), customers (acceptance of sustainable products), and regulators (enforcement of directives). It is both, obligatory in some (electronics, automotive, packaging) and a competitive advantage in others for being a pioneer and a leading company on sustainability.

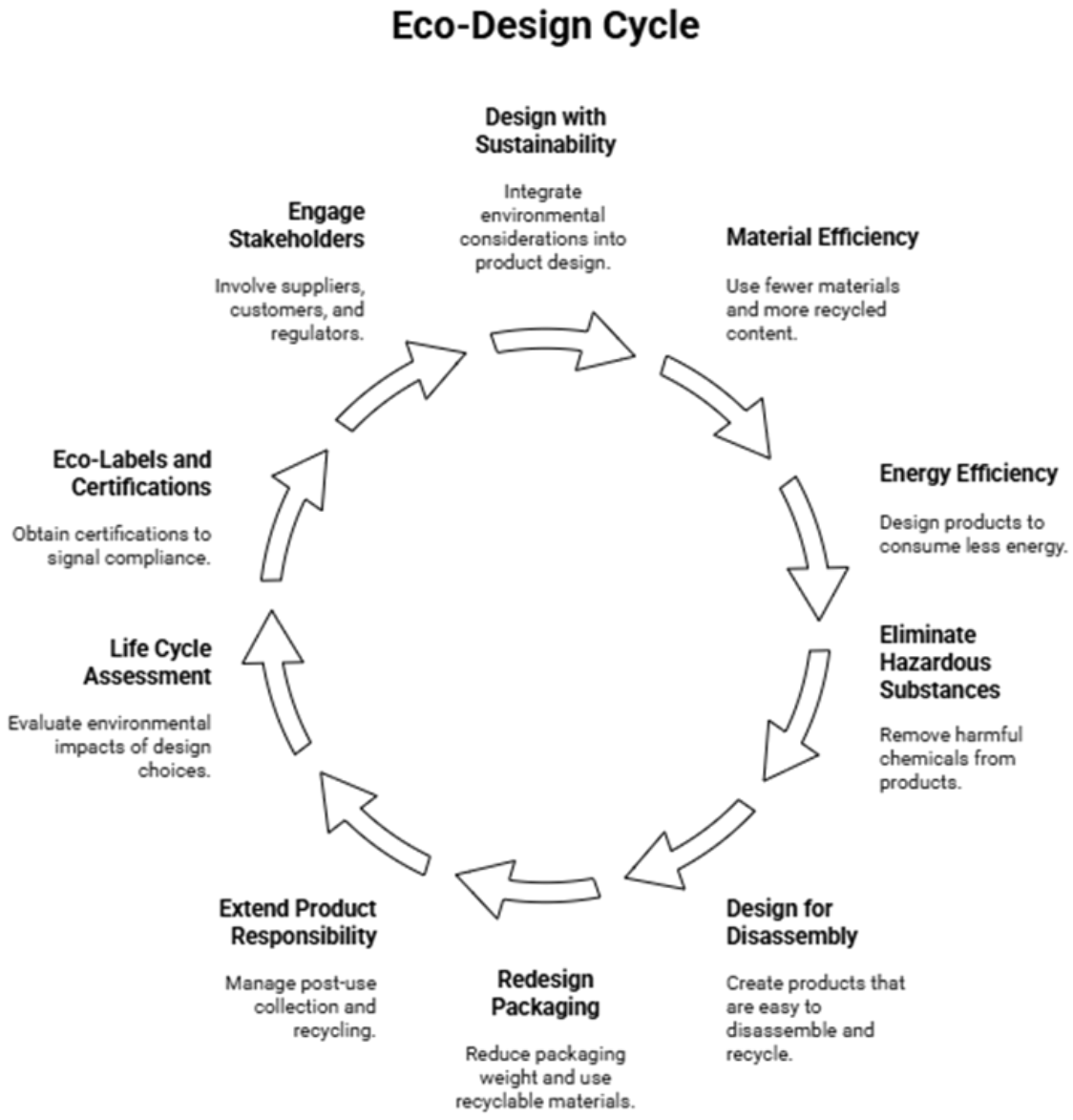


Figure 5 Eco-Design Cycle (Author's own work)

Why it matters? From an NRBV standpoint, competencies in eco-design, for instance expertise in the design in recycled materials or in closed-loop systems, are rare, valuable, and inimitable, and they create a base for sustaining competitive advantage (Hart, 1995). From an institutional perspective, eco-design may be accepted as a matter of regulatory compliance

(e.g., EU Circular Economy Action Plan, Extended Producer Responsibility) and normative expectations regarding professional design practices. From a diffusion perspective, innovating firms like IKEA or HP play the role of early adopters which are reference points that other firms eventually follow.

Eco-design/product stewardship, in other words, has been a strategic enabler for GSCM, as it operationalizes environmental responsibility in product terms and through product attributes that are distinct and measurable and the product should meet.(Hervani et al., 2005; Zhu and Sarkis, 2006; Green et al., 2012).

In interviews, probe who "owns" the following: design rules and stage-gate criteria, LCA capability (i.e. the tools, the team, how results have changed specifics), hazardous substance management (ownership of the RSL, supplier engagement), and packaging redesigns (flat-pack, material swaps, refills). Uncover product Environmental Profiles' and Eco-labels' claims and supporting evidence, information from design standard documents, and analyze packaging/weight/ energy trends across generations of products from secondary resources.

Anchor (Eco-design). Eco-design shifts costs and impacts early (materials, weight, modularity), which improves yields and logistics before economic effects accrue. (Green et al., 2012).

2.3.4. Customer Collaboration (Downstream)

Customer collaboration is generally understood as the downstream aspect of Green Supply Chain Management (GSCM) and comprises the initiatives through which companies involve theircustomers in the joint effort to minimize the environmental impacts and improve the sustainability performance of products throughout their entire lifecycles. More specifically, Hervani, Helms and Sarkis (2005, p. 337) explain that GSCM entails "incorporating environmental concerns in the management of the supply chain, which includes product design, material selection, the manufacturing process, final delivery to the customer, and disposal of the product at end of its useful life". In addition to this, Green et al. (2012) highlight that "customer collaboration…ensure[s] that E-logic permeates to market-facing activities of the supply chain, such as eco-packaging, energy-efficient products, recycling and take-back systems, sustainability reporting to customers".

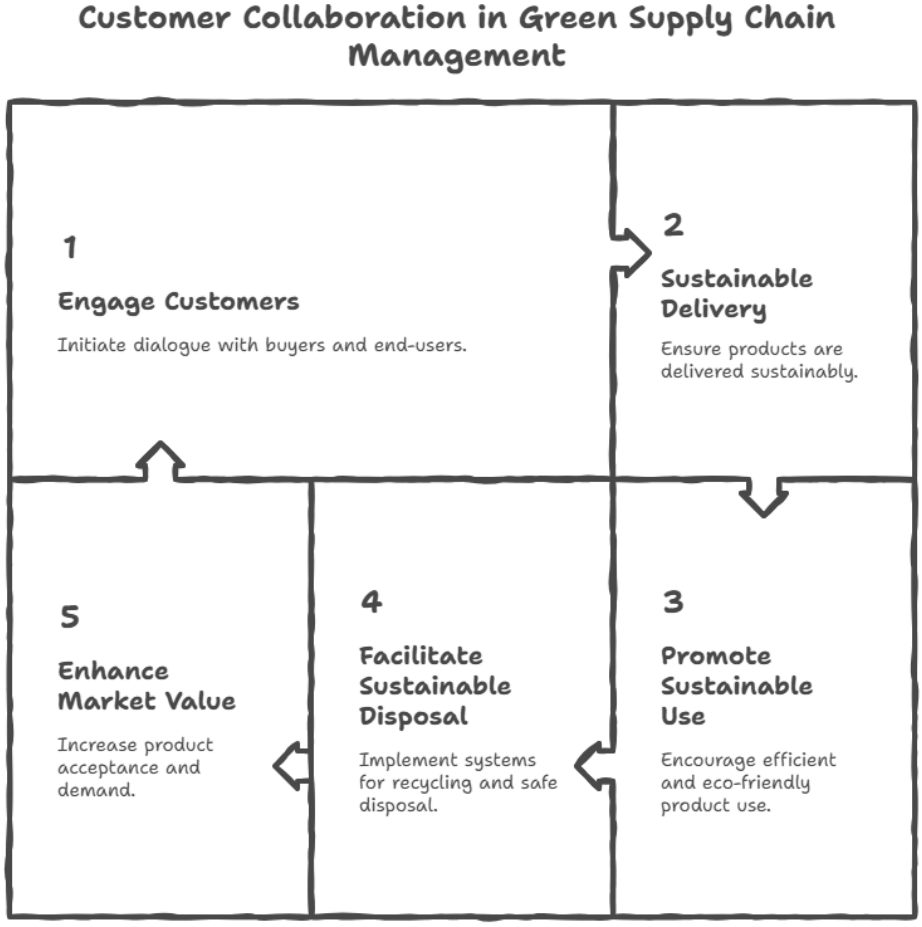


Figure 6 Customer Collaboration in GSCM (Author's own work)

Downstream collaboration takes multiple forms:
Greener packaging: this can imply new products design that lightens the weight of the packaging, substitution of materials that are easier to recycle, and packaging that minimizes logistics.
Solutions requiring cleaner use-phase: Product design with decreased energy or water consumption, refills, or longer service life.
Return, reuse, take-back programs: Providing customers with a means to return used items for recycling or remanufacturing.
Environmental transparency: Making information about environmental characteristics (carbon footprints, recyclability scores, eco-labels) available to customers to help make sustainable purchasing decisions .
Co-creation: partner with B2B customers or retailers to create green initiatives in forms of closed-loop packaging or product service systems.
In that sense, customer collaboration is not just a sustainability feature, but it is also a marketing strategic and a way of building relationships, serving to underpin the compliance with green expectations and the competitive differentiation in the markets.

How it's measured? Customer participation is often evaluated with Likert items in surveys asking the extent to which:
Degree of customer involvement in packaging or ecodesign.Engagement of the customers in defining environmental benefits from the product or service, for example, in tenders or contracts.Regularity of information exchange (reports, dashboards, joining committees). Existence of customer audits or reviews.Percentage of sales from products labeled as eco or with take-back capabilities.
Down-stream partners are found to improve environmental and financial performance, especially if the initiatives are combined with positioning strategies, such as premium branding or loyalty strategies, as illustrated by Laari, Töyli, and Ojala (2018) . Secondary data sources, such as copy of the customer MOU, metrics on packaging reduction, and eco-label sales reports, are used to validate self-reported survey measures.

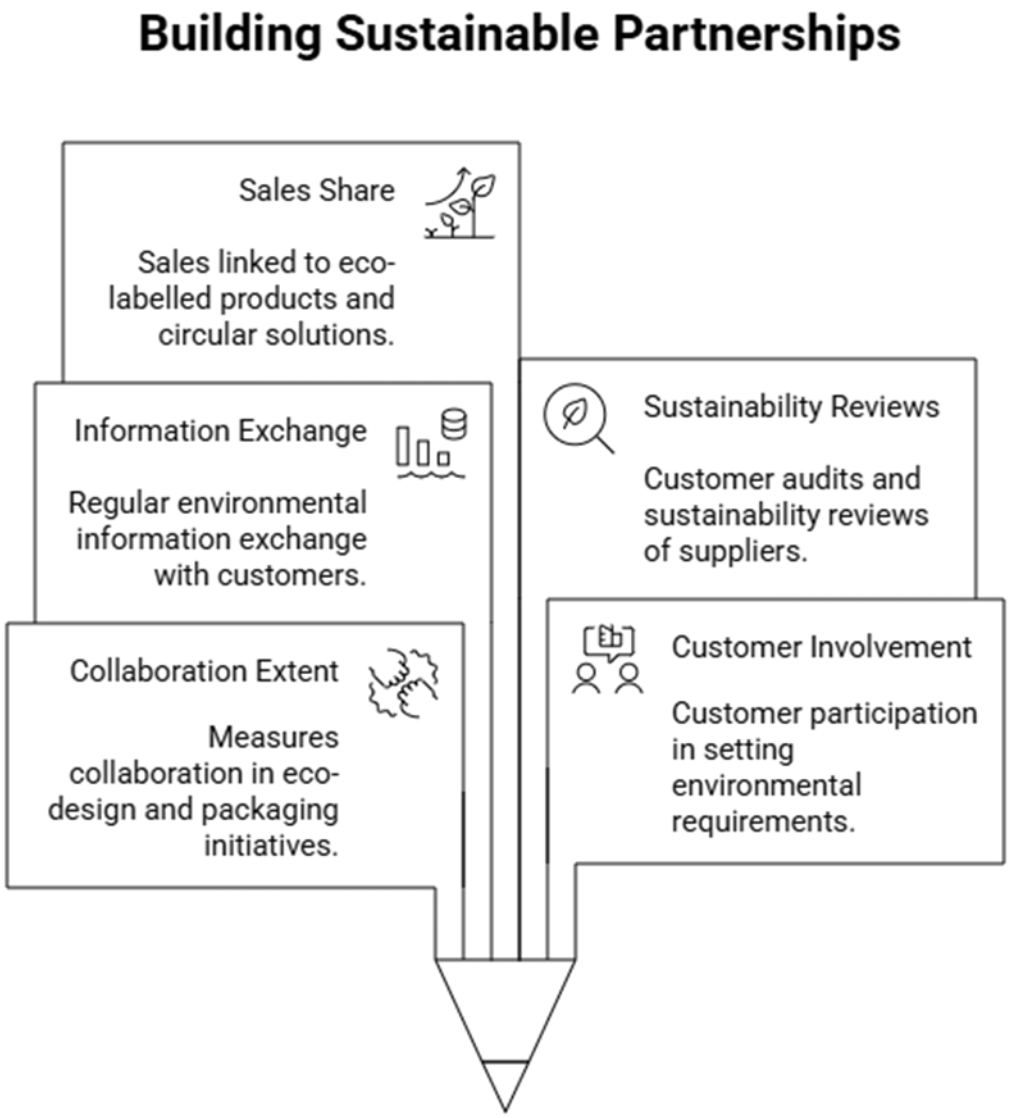


Figure 7 Building Sustainable Partnerships (Author's own work)

In interviews: probe for customer requests (RFP's criteria), evidence of joint pilots (reusable packaging, circular economy projects) and take-back programs. Ask in what ways and why environmental needs are based on customer needs and how feedback loops are dealt with. Secondary data: number of requests and informal agreements with customers, level of packaging waste reduction per SKU and number of eco-labeled products.

Anchor (Supplier/Green purchasing). Upstream collaboration and environmental purchasing spread process changes to suppliers—reducing defects, scrap, and energy

intensity that later show up in operational metrics. (Green et al., 2012; Seuring & Müller, 2008).

2.3.5. Reverse Logistics / Investment Recovery

The reverse logistics and recovery of investments falls under the life cycle and resource recovery aspect of GSCM, and concerns the issues associated with the way in which products, materials, and packaging are collected, returned, reused, remanufactured, and recycled. If the supply chain has traditionally been de- scribed as a line leading from supplier to customer, a closed-loop reverse logistics chain leads in a continuous circle, sucking used products in one end and value out the other, filtering excess waste out of the system and keeping it from the landfill where it might reasonably have ended its useful life. Its extension is the recovery of overhauled materials, depreciated machinery, waste products, and even the sale/exchange of return products – in other words, the environmental or monetary value of residuals.

Hervani et al. (2005) characterize RL as incorporating reverse flows in supply chain planning, whereas Zhu and Sarkis (2006) refer to RL as a means to "close the loop" of sustainable supply chains. Some commonalities among these practices are:

Collection systems: implementing re-use programs for products, packaging or parts.

Reuse/Remanufacturing: Re-furbishing returned products or utilizing components by re-making them to increase the life of a product .

Recycling- removal of plastics, metals, paper etc. from returns.

Safe disposal: Disposal of hazardous materials (batteries, electronics) in an environmentally compliant manner.

Asset recovery : re-selling excess or obsolete materials, equipment or returned goods on the secondary markets.

Reverse Logistics is very connected to this circular economy model, in which goods are designed for many lives so as to retain value for the longest time possible. It has become a regulatory obligation (i.e. WEEE Directive in the EU, Extended Producer Responsibility schemes) and a competitive advantage for companies seeking cost savings, new revenues, and improved reputation.

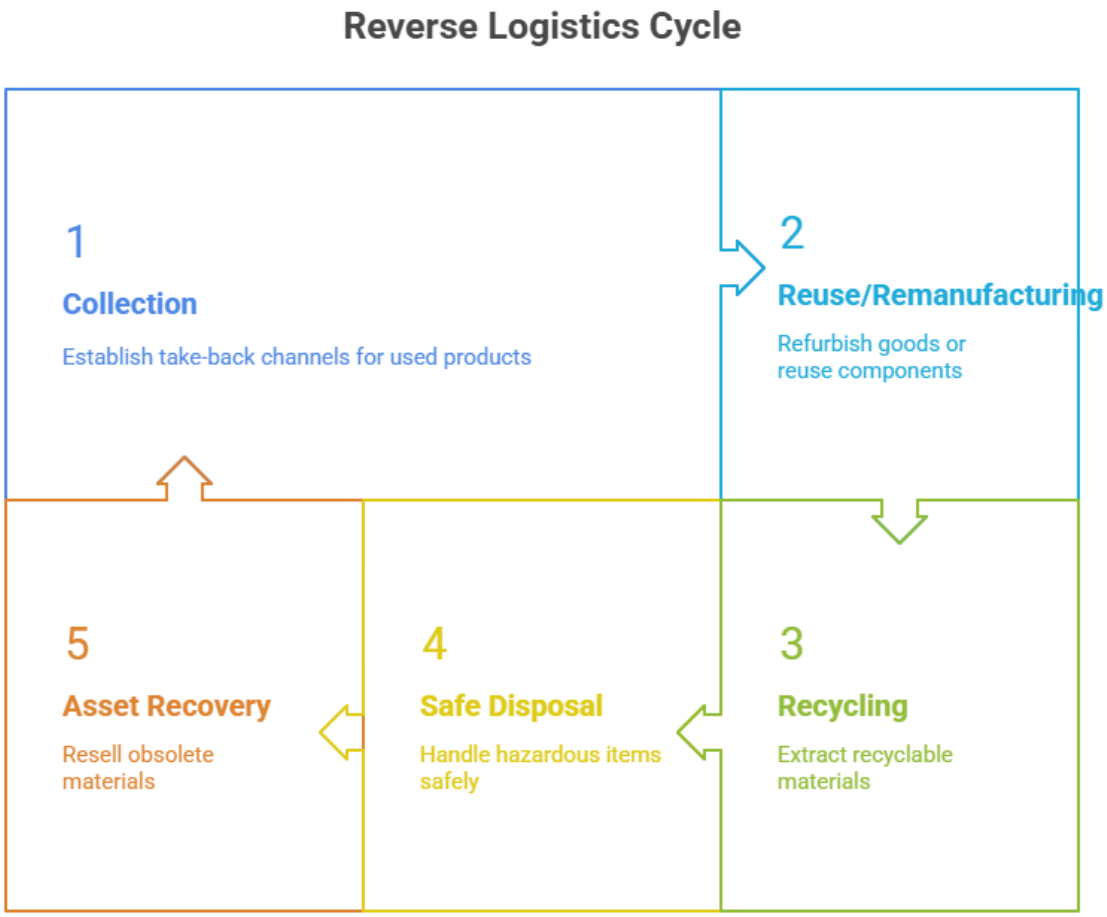


Figure 8 Reverse Logistics Cycle (Author's own work)

How it's measured? Research on reverse logistics and recapturing investments have primarily addressed the following items, scored through Likert scale:

Take-back programs for products/packaging.Proportion of recycled, refurbished, or reused products or materials. Level/intensity of reverse logistics initiatives (e.g. systems of collection, remanufacturing facilities). Utilization of investment recovery programs (i.e. resale of scrap, obsolete materials, surplus inventory). Economic role of reverse logistics – cost savings and revenue generating.

Indicators of secondary data encompass the number of returned units, how many are landfilled versus recycled, revenue generated through recapture, and adherence to certain regulatory imperatives (WEEE, RoHS).

Interviews: Of the handling of returned products, in-house or outsourcing of reverse logistics, the inclusion of remanufacturing, and the customer in the return flow. Ask about costs barriers, complexity of logistics barriers, and IT systems enablers, partnerships enablers.

Secondary data: Gathering facts on amount of returns, ratio of recoverables, revenue from sales proceeds, and compromise information mentions in sustainability/csr reports.
Anchor (Reverse logistics). Reverse logistics/closed-loop systems (collection, reuse/reman, recycling, safe disposal, asset recovery) add EP/OP benefits first and, where secondary markets exist, create revenue. (Govindan et al., 2015)

2.4. Evidence & Why Payoffs Differ (answers RQ1)

Numerous studies have shown that GSCM is positively associated with performance across the three levels of outcomes, market, operational, accounting/financial. This field-defining meta-analysis, which incorporates years of studies, indicates substantial positive effects across several industries/regions, as does the influence of practice applied (upstream, design/production, downstream) and practice maturation/bundling. In short, green pays for average but payoffs are heterogeneous. (Golicic & Smith 2013; Seuring & Müller 2008).
Placing GSCM under the broader SSCM umbrella helps explain that variation: outcomes depend on supply-chain configuration and coordination (going beyond internal to supplier/customer collaboration and closed-loop flows), institutional/stakeholder pressures, and integrated practice bundles rather than isolated initiatives. (Seuring & Müller, 2008)

2.4.1. What the strongest evidence shows

A field-defining meta-analysis by Golicic and Smith (2013) aggregates results from prior quantitative studies and finds statistically significant, positive relationships between environmentally sustainable/green SCM practices and three performance families:

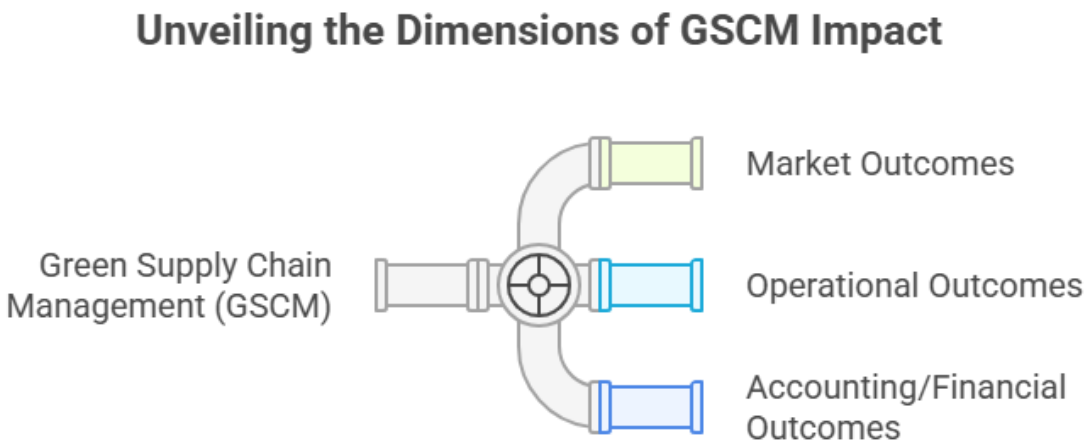


Figure 9 Dimensions of GSCM Impact (Author's own work)

Importantly, the meta-analysis also probes conditions (industry, region, firm size, time period, and where in the chain practices are applied—upstream, design/production,

downstream) and concludes that these factors alter the size of the payoff, not its direction: on average, "green pays." (Golicic & Smith, 2013, Journal of Supply Chain Management, 49(2), 78–95.)

2.4.2. Why payoffs differ

Placing GSCM within sustainable supply chain management (SSCM) helps explain variation in effects. Seuring and Müller (2008) synthesize the literature and argue that realized performance depends on:

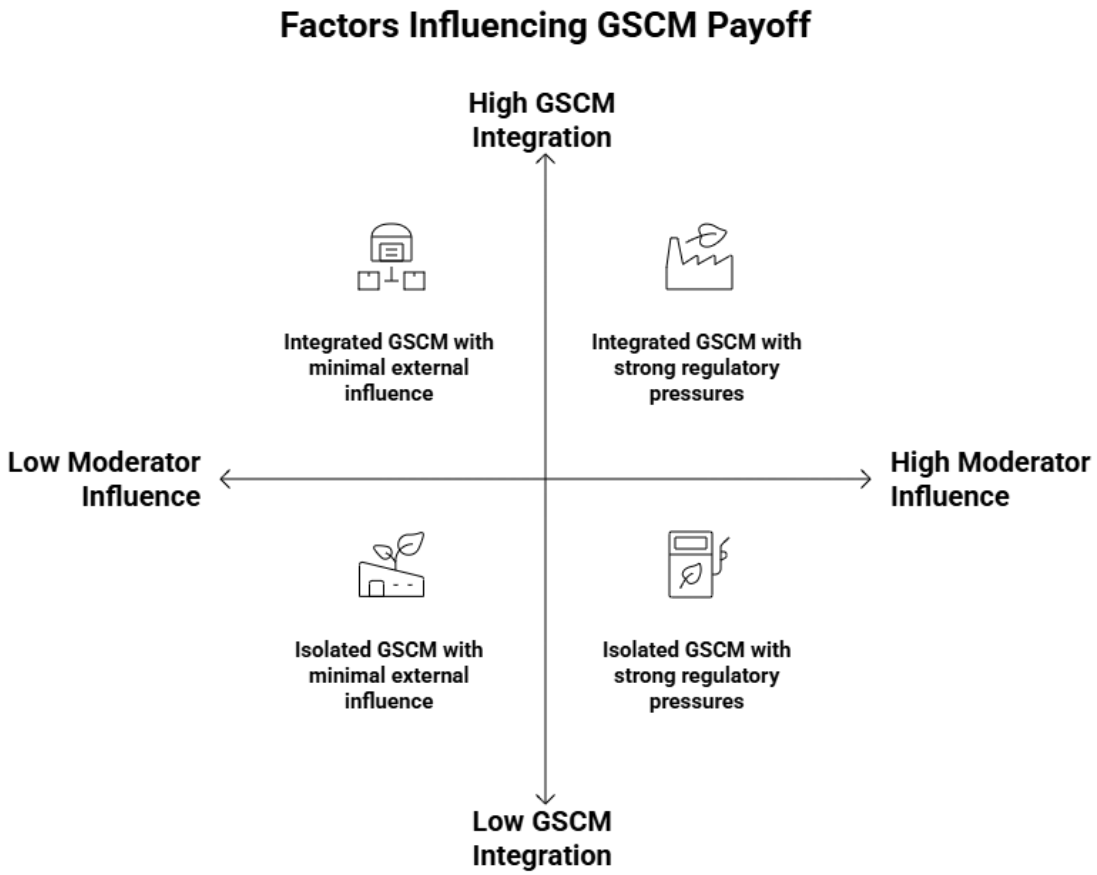


Figure 10 Factors Influencing GSCM Payoff (Author's own work)

Supply-chain configuration and coordination—whether firms move beyond internal systems to supplier development, customer collaboration, and closed-loop (reverse) flows; Institutional/regulatory pressures and stakeholder expectations—which differ across regions and sectors and shape both adoption and returns; and Practice bundles and maturity—integrated, capability-supported bundles (e.g., internal environmental management + green purchasing + eco-design + reverse logistics) tend to produce stronger and more durable

effects than isolated activities. (Seuring & Müller, 2008, Journal of Cleaner Production, 16(15), 1699–1710.)

How “green” turns into performance (mechanisms and sequencing)

Across studies, the sequence is consistent:

Operational pathway: GSCM practices typically improve environmental and operational performance first (lower waste/emissions, better yields and throughput), which then mediate gains in accounting outcomes (cost, productivity, profitability). Validated practice bundles—internal environmental management (IEM), supplier collaboration/green purchasing, eco-design, customer collaboration, and reverse logistics—map cleanly onto this pathway (Green, Zelbst, Meacham, & Bhadauria, 2012, Supply Chain Management: An International Journal, 17(3), 290–305)

Market pathway: Product/process stewardship can enhance reputation and customer access (e.g., meeting buyer requirements, qualification for tenders), supporting market-based outcomes that may translate into price premia or share gains in receptive segments (Golicic & Smith, 2013).

Risk pathway: Reduced exposure to regulatory penalties, supply disruptions, and reputational crises stabilizes performance—benefits that often appear indirectly in financial aggregates (Golicic & Smith, 2013).

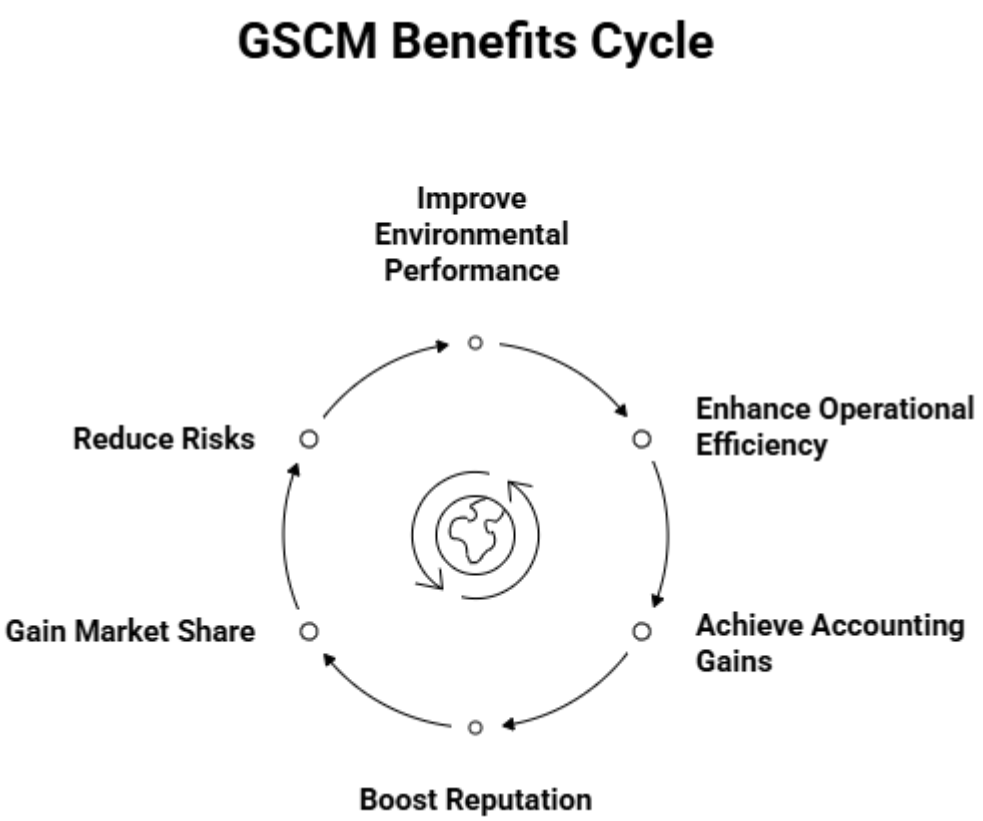


Figure 11 GSCM benefits cycle (Author's own work)

2.4.3. Boundary conditions and "fit"

Effects are context-dependent. In logistics services, for example, Laari, Töyli, and Ojala (2018) show that financial and environmental payoffs are stronger when GSCM is aligned with the provider's competitive strategy; misaligned initiatives raise costs without commensurate gains (Business Strategy and the Environment, 27(7), 872–883). Similarly, reverse-logistics outcomes hinge on network design, product characteristics, and governance; poorly designed loops can dilute or delay financial returns even if environmental benefits are present (Govindan, Soleimani, & Kannan, 2015, European Journal of Operational Research, 240(3), 603–626).

Method considerations (why some studies disagree)

Inconsistencies in the literature often reflect measurement and design choices:

Heavy reliance on cross-sectional, self-reported indicators can inflate associations; triangulating with objective measures (e.g., ISO 14001 scope, recovery yields, audited KPIs) gives more credible estimates.

Timing/lags matter (e.g., eco-design and reverse-logistics benefits may materialize later). Practice definition and sectoral mix vary across samples, affecting effect sizes. Meta-analytic modeling of conditions, as in Golicic & Smith (2013), helps reconcile these differences.

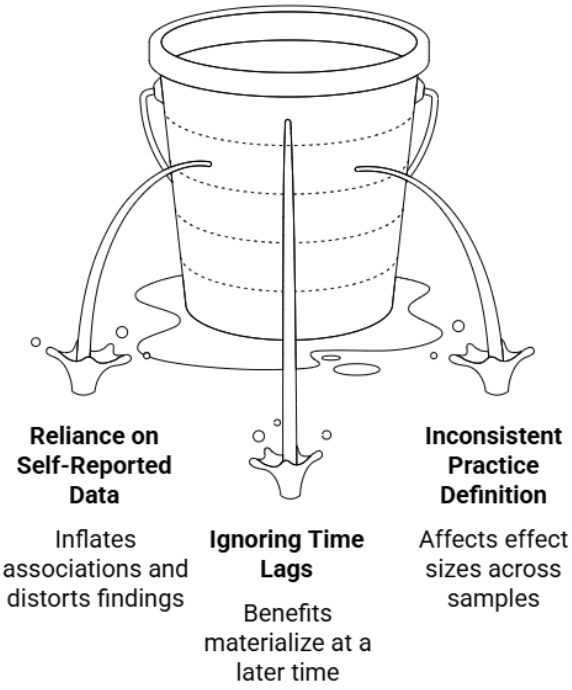


Figure 12 Addressing Inconsistencies in Research Findings (Author's own work)

Implications for this thesis (how to report RQ1)

State the average positive effect—cite the meta-analysis to anchor the business case—then discuss when/why magnitudes differ using the SSCM lens (Golicic & Smith, 2013; Seuring & Müller, 2008).

Report outcomes in three buckets—market, operational, accounting—to mirror the meta-analytic structure and aid comparability.

Describe the practice bundle and maturity in your cases (internal systems + supplier/customer collaboration + eco-design + reverse flows). Note that partial/isolated adoption usually delivers smaller, less reliable gains (Green et al., 2012; Seuring & Müller, 2008; Govindan et al., 2015).

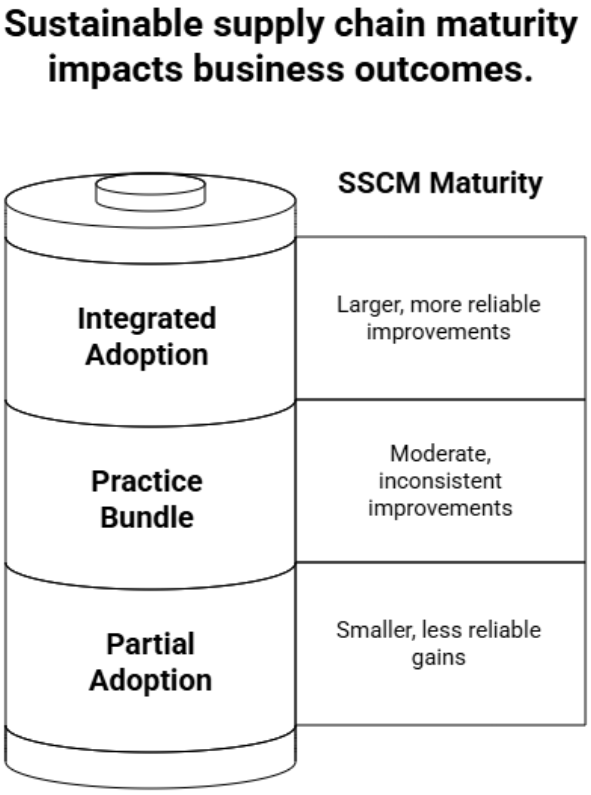
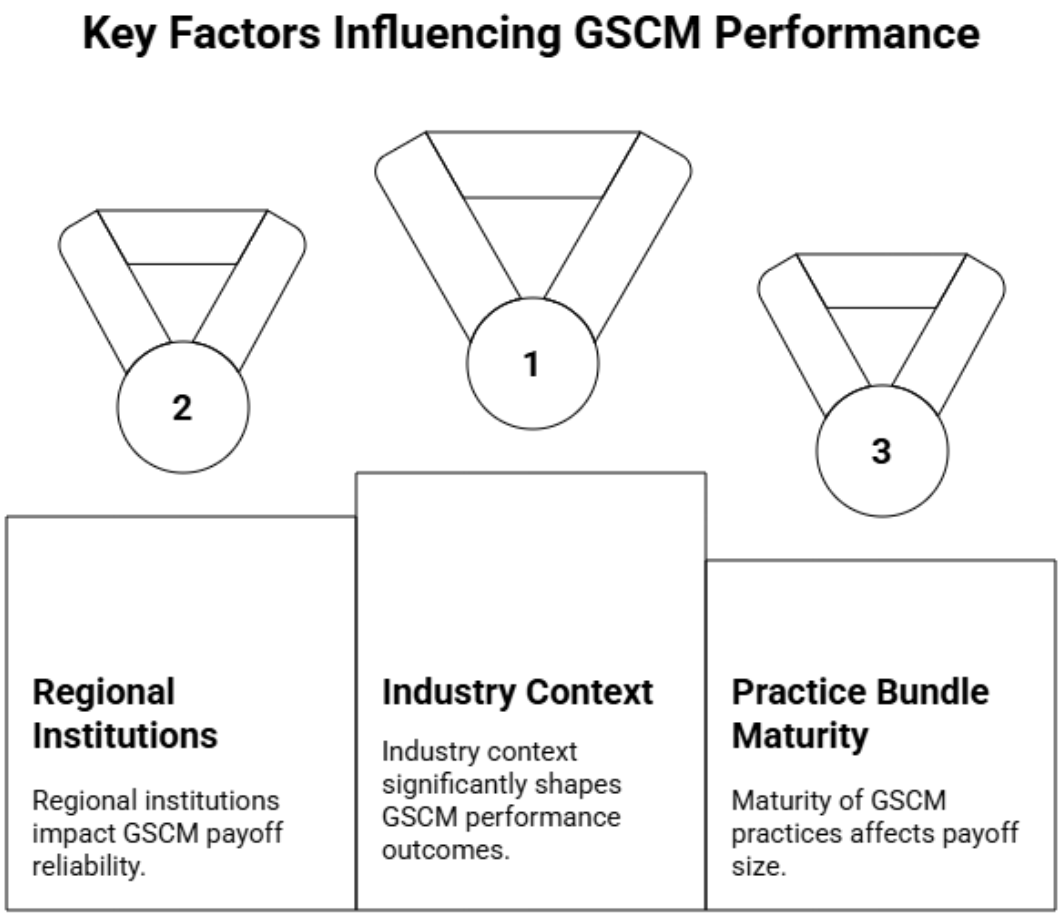


Figure 13 Sustainable supply chain maturity impacts business outcomes (Author's own work)

Bottom line: The cumulative evidence supports a business case: GSCM performance on average—across market, operational, and accounting measures—while the size and reliability of the payoff depend on industry context, regional institutions, and the

coherence/maturity of the practice bundle implemented. (Golicic & Smith, 2013, pp. 78–95; Seuring & Müller, 2008, pp. 1699–1710.)

Figure 14 Key factors influencing GSCM performance (Author's own work)



2.5. How 'Green' Turns into Results (Mechanisms & Conditions)

This sequence has remained constant: practice adoption improved environmental and operational performance first, lowering waste/energy/emissions, less defects, and improve throughput, and the improvement in those outcomes are also financial/reputational results. Here, we used used practice bundles called IEM, supplier/customer collaboration, eco-design, and reverse logistics to connect the practice clusters. (Green et al., 2012).

There are conditions of speed or stall conversion. On a logical basis, EPO/OP's conversion from EP/OP into economic outcomes is enhanced when "i" institutional/buyer pressures are credible, "ii" practice bundles fit the firm's strategy and process architecture, and "iii" digital

enablement/Green-IS is reliable in measuring and visibility among partners. In particular, Laari et al., 2018, Zhu, Sarkis & Lai, 2012, Bokolo, 2019).

2.5.1. How we trace mechanisms qualitatively

I present the quantitative method of tracing mechanisms. This study not only probes statistical mediation, but also reveals mechanisms by interpreting cases of practice that have concrete experience in one stage and then into economic/reputational consequences after moving to a point of actual practice and looking for effects of a buyer pressure, strategic fit, digital measurement. We draw patterns and contradictions from code-theme exemplars and cross-case matrices to estimate consistency of pattern and rival explanations. (In keeping with the RQs and the qualitative multiple case design provided in Chapter 3)

Empirically, qualitative syntheses show that GSCM practices relate positively to performance on average, but heterogeneously across contexts—consistent with a mediated business case rather than a uniform direct payoff. We therefore use prior survey findings as sensitizing theory while tracing mechanisms qualitatively in our cases. See Feng et al. (2018, *Business Strategy and the Environment*) for the EP/OP mechanisms result; and Golicic & Smith (2013, *Journal of Supply Chain Management*) for meta-analytic variance that motivates examining conditions under which conversion strengthens.

Our practice coding follows widely used GSCM dimensions—internal environmental management, supplier/customer collaboration, eco-design, and reverse logistics—so that evidence is comparable with established constructs (Green et al., 2012). We keep EP (e.g., emissions/waste reduction, energy/water intensity, ISO-14001 scope) distinct from OP (e.g., first-pass yield, defects, cycle time, unit cost), because theory and evidence suggest a result ordering: practices improve EP/OP first; conversion to economic/reputational outcomes occurs when those improvements are credible, measured, and valued in the market or by regulators (Seuring & Müller, 2008).

Finally, we explicitly attend to timing and context in our process tracing. Diffusion/ecological-modernization studies suggest adoption, routinization, and capability maturity drive *how fast* mechanisms appear and whether they are rewarded (Zhu, Sarkis & Lai, 2012). For reverse logistics, reviews show early EP wins with economic payoffs emerging once network design, grading quality, and secondary markets stabilize—so we expect and record lags (Govindan, Soleimani & Kannan, 2015). These literatures justify our use of temporal bracketing, triangulated evidence, and context–mechanism–outcome comparisons to answer RQ2 in a way that is theoretically grounded yet appropriate for a qualitative multi-case design.

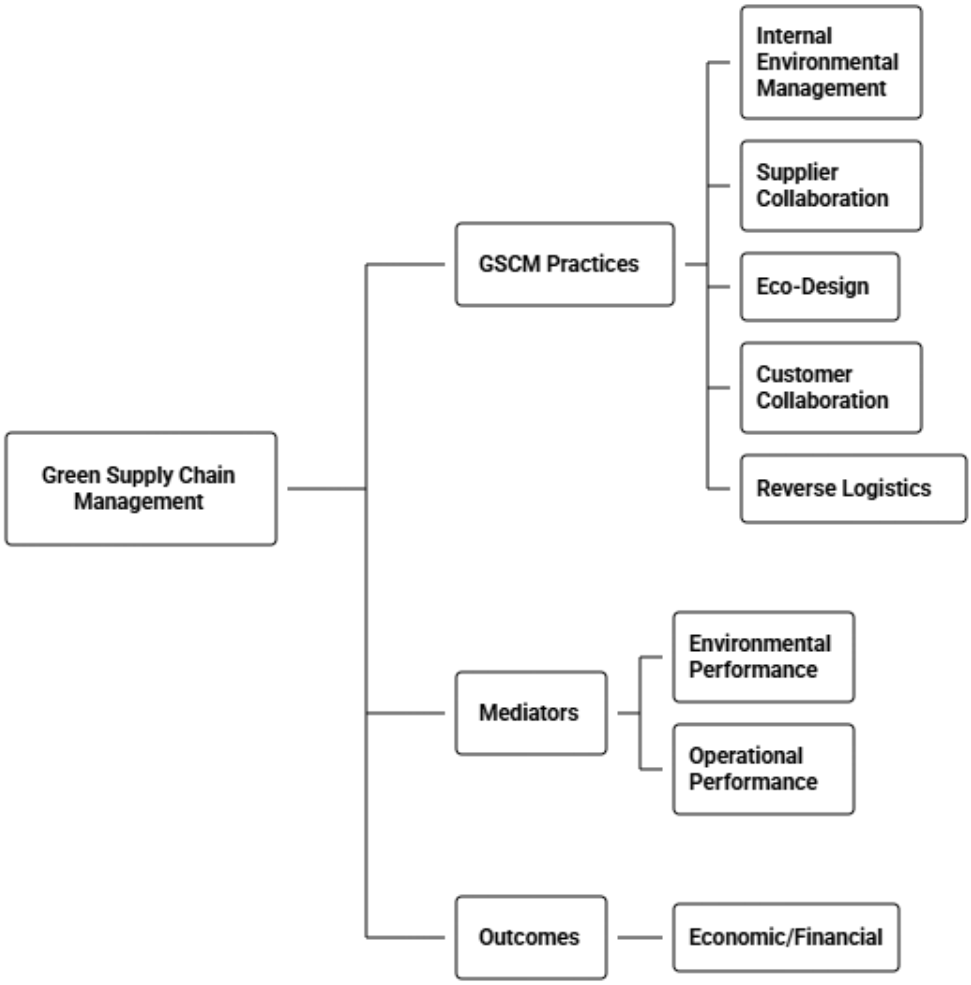


Figure 15 GSCM practices & Outcomes (Author's own work)

2.5.2. Why this mechanism fits prior evidence

Operational bridge (GSCM → Operational → Economic). In most settings, the first visible payoffs from GSCM are process improvements: scrap and rework fall, first-pass yield rises, materials/energy are used more efficiently, and throughput becomes smoother. Internal environmental management (targets, audits, EMS/ISO 14001), together with supplier collaboration and eco-design, reduces process variability and non-value-adding activities; that shows up as shorter cycle times, fewer defects, lower unit costs, and better delivery reliability. These operational gains are the "workhorse" mechanisms that translate green

practices into accounting outcomes (cost savings, productivity, margins). Empirically, this is exactly the pattern captured in validated GSCM models where environmental and operational performance carry a substantial share of the total effect to financials (often partial mediation, sometimes full), with operational improvements typically exerting a stronger and faster influence on economic performance (Green, Zelbst, Meacham, & Bhadauria, 2012, *Supply Chain Management: An International Journal*, 17(3), 290–305).

Environmental channel (GSCM → Environmental → Economic). A second pathway runs through environmental performance. Lower emissions, waste, and resource intensity directly cut compliance and risk costs (fees, penalties, incident clean-ups) and reduce the probability of disruptive events (e.g., hazardous spills). At the same time, demonstrable environmental leadership can improve market access—from qualifying for public procurement and large-buyer tenders that require environmental disclosures/certifications to meeting eco-label criteria that influence purchasing in certain segments. Classic evidence shows that credible environmental initiatives can be value-relevant to capital markets and customers, supporting reputational assets that complement cost savings (Klassen & McLaughlin, 1996, *Management Science*, 42(8), 1199–1214.). In mediation terms, this channel can be slower than the operational bridge (because verification, certifications, and market signaling take time), but in regulated or sustainability-sensitive markets it becomes a material conduit of financial benefits.

Spillovers across tiers (GSCM → Supply-chain diffusion → Environmental/Operational → Economic). GSCM is rarely confined to the focal firm. Supplier development and customer collaboration diffuse practices (e.g., process controls, cleaner inputs, packaging redesign, information sharing) upstream and downstream, amplifying improvements beyond a single plant or warehouse. When buyers codify environmental criteria and offer technical support, suppliers adopt cleaner processes or substitute hazardous materials; when customers join packaging and logistics initiatives, damage and handling losses drop and loads are consolidated. These inter-organizational routines propagate efficiency and environmental improvements across multiple nodes, so the aggregate effect on costs, reliability, and risk is larger than the focal firm's internal changes alone (Zhu & Sarkis, 2006, *Journal of Cleaner Production*, 14(5), 472–486). Practically, this means the a-paths into the mechanisms strengthen when collaboration is real (joint projects, audited results) rather than merely contractual (policy text without enforcement).

Closed-loop economics (Reverse flows → Environmental/Operational → Economic). Where products, parts, or materials can be repaired, refurbished, remanufactured, or recycled, well-

designed reverse logistics systems create two reinforcing effects. First, recovery value/material offset reduces virgin input purchases and creates revenue from resale or secondary markets. Second, well-run take-back networks and standardization for disassembly can improve forward-flow efficiency (e.g., modular designs simplify both assembly and recovery). However, these gains are highly contingent on network design (collection density, sorting accuracy, proximity of refurbish/reman sites), product characteristics (value density, condition variability), and governance (who owns the reverse nodes). Weak designs suffer from low return quality, high handling costs, and leakage into informal channels, which dilutes or delays the financial payoff even when environmental benefits are present (Govindan, Soleimani, & Kannan, 2015, *European Journal of Operational Research*, 240(3), 603–626). In mediation terms, the reverse-logistics leg can take longer to influence accounting outcomes but, once scaled and stabilized, it becomes a durable contributor to economic performance through recurring recovery yields and input cost reductions.

What this implies:

Expect operational performance to be the stronger, earlier mediator, with environmental performance contributing both directly (cost/risk) and indirectly (market access/reputation). (Green et al., 2012; Klassen & McLaughlin, 1996).

Strengthen a-paths by documenting real collaboration (supplier/customer projects with before/after data), not just policies; this aligns with the tier-diffusion logic (Zhu & Sarkis, 2006).Treat reverse-logistics effects as context-dependent and potentially lagged; report recovery metrics (return rate, yield, €/unit recovered) and governance explicitly to explain variation (Govindan et al., 2015).

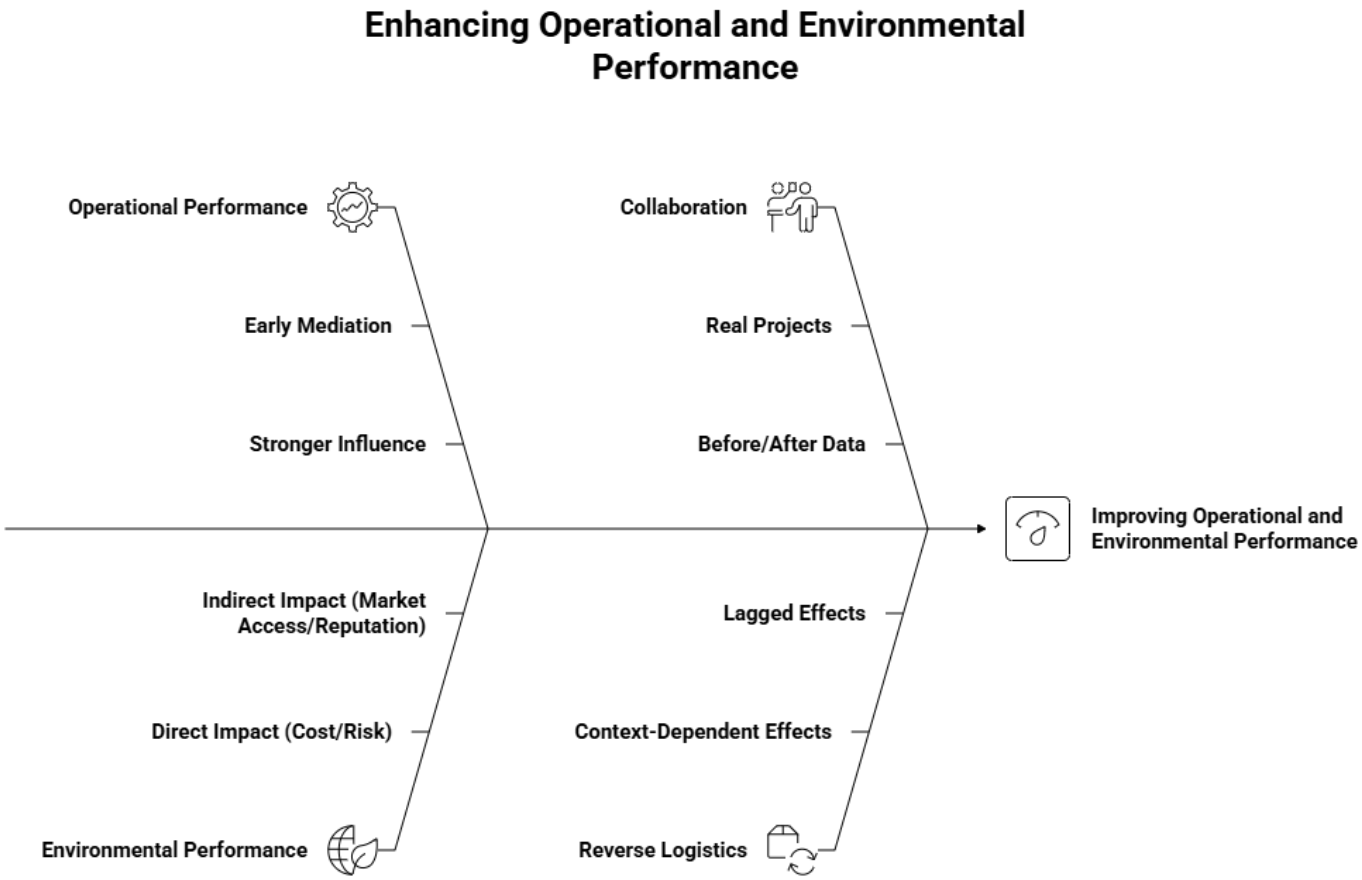


Figure 16 Improving Operational & Environmental Performance (Author's own work)

2.5.3. What the Literature Typically Finds

Overall, evidence from across contexts supports the perspective that GSCM has indirect economic benefits by means of enhancing firms' environmental and operational performance, even if the exact mediation process might vary.

Indirect-plus vs. indirect-only patterns: While several studies have determined environmental and operational performance as the critical mediator, Green et al. (2012) explain that, through market reputation, legitimacy, and customer goodwill, GSCM has also a direct effect in financial performance. This supports Zhu and Sarkis (2004) contention that adopting green enhances the ability to serve environmentally conscious markets, leading not only to direct financial benefits, but to indirect efficiency benefits.

Efficiency-led: Particularly in manufacturing sectors that are sensitive to price pressures, they are frequently the only way to achieve any financial benefits or returns. For instance, Sahoo

and Vijayvargy (2021) show that environmental and operational improvements were the only explanatory variables of financial performance of Indian firms, since the direct impacts of GSCM on profitability were non-significant. This is consistent with Klassen and Whybark's (1999) perspective, stating that productivity operations (such as that related to waste reduction and quality consistency) are the only path connecting environmentally responsible action to the capacity to be competitive in cost.

Asymmetric mechanisms: As well, the financial conversion of operational improvements is much quicker and more pronounced that of environmental improvements. Zhu and Sarkis (2006) found that cleaner processes were substantially more cost efficient as a direct process rather than eco-compliance, which often was more indirect. Similarly, Sarkis et al. (2011), found that while environmental measures enhance legitimacy, traditional operational KPIs (throughput, yield, and defect rates) actually drive short term profitability.

Practice-mix sensitivity: Combined adoption of various GSCM practices increases mediation . Rao & Holt (2005) find positive synergistic effects of linking internal environmental management with supplier/ customer cooperation and with eco-design, while not finding strong performance advantages by 'aggregating in all categories'. This is further supported by Zhu et al. (2008) explaining that practice complementarities are also very important in order to generate substantial economic advantages.

2.5.4. Boundary Conditions (When Mediation Weakens or Strengthens)

This indirect effect is dependent on contextual factors which serve to enhance or weaken the transmission from GSCM to financial outcomes.

Regulatory and market context**:** As underlined by Seuring and Müller (2008), the environmental legislation as well as environmental buyer pressure increase the mediating effect, as compliance with improvements "rapidly becomes a precondition for market access". On other one, in environments with weaker regulation, the GSCM → financial link is weaker because firms might not have sufficient external pressures that help them see the potential that environmental improvements have as possible sources of competitive advantages (Zhu, Sarkis & Lai, 2012) .

Time lags: Eco-design and closed loop systems, for example, are also long term investments. Zhu et al. (2013) found that, in some Chinese companies, no immediate financial returns were associated with eco-design investments but returns were seen after several years of maturity of supply chains. Klassen and McLaughlin (1996) make a similar argument that the reputational benefits and market opportunities associated with environmental leadership have a longer lag time than operational efficiency savings.

Governance and scale in reverse flows: Poor governance of reverse logistic processes causes low yields of recovery and low financial performance according to Govindan et al., (2015) . Srivastava (2007) goes on to explain that, without correct IT systems alligned stakeholders, and the logistical infrstructure, the loop remains "open" – where economic gains are sacrificed for environmental ones.

Strategic fit with competitive positioning: Laari, Töyli, & Ojala (2018) reveal that combining GSCM to strategic objectives (cost leadership, differentiation, or sustainability branding) lead to better economic results for the the company. Likewise, environmental practices can generate benefits for either the business or the environment, or both (Golicic & Smith, 2013) only if they are aligned with other strategic orientations such as supply chain orientation (SCO) and environmental orientation (EO) according to Kirchoff, Tate and Mollenkopf (2016).

Here's Comparative Summary of Mediation Patterns and Boundary Conditions in GSCM — showing themes, key authors, findings, and managerial/theoretical implications.

Theme	**Key Authors**	**Findings**	**Implications**
Partial mediation (common)	Green et al. (2012); Zhu & Sarkis (2004)	Direct + indirect effects: GSCM improves financials via environmental/operational gains and market/reputation channels.	Expect residual direct GSCM effects beyond mediation pathways.
Full mediation (efficiency-driven contexts)	Sahoo & Vijayvargy (2021); Klassen & Whybark (1999)	Financial gains only realized through environmental and operational improvements; direct path often insignificant.	Firms must prioritize EP/OP improvements for economic returns.
Asymmetric mechanisms	Zhu & Sarkis (2006); Sarkis, Zhu & Lai (2011)	Operational → financial faster/stronger; Environmental → financial slower, often indirect (via operations).	Focus on OP for short-term gains, EP for long-term sustainability.
Practice-mix sensitivity	Rao & Holt (2005); Zhu et al. (2008)	Integrated adoption of multiple practices produces stronger mediation effects than isolated initiatives.	Encourage bundled practice adoption across the supply chain.

Regulatory & market context	Seuring & Müller (2008); Zhu, Sarkis & Lai (2012)	Strong regulatory/buyer pressure strengthens mediation; weak institutional environments dilute effects.	Mediation outcomes stronger in strict policy/regulatory regimes.
Time lags	Zhu et al. (2013); Klassen & McLaughlin (1996)	Eco-design and closed-loop systems take longer; operational improvements deliver quicker returns.	Plan GSCM investments with medium-/long-term horizons in mind.
Governance & scale in reverse flows	Govindan et al. (2015); Srivastava (2007)	Without robust governance/scale, recovery yields remain low, limiting financial outcomes.	Build IT systems, networks, and partnerships to unlock reverse logistics value.
Strategic fit with competitive positioning	Laari et al. (2018); Golicic & Smith (2013); Kirchoff et al. (2016)	Strategic alignment amplifies EP/OP → financial conversion; misalignment weakens results.	Integrate GSCM with cost, quality, or differentiation strategies.

Table 3 Mechanisms & Conditions Map

2.6. Boundary Conditions & mechanisms

Value is not generated by GSCM in a vacuum; it is generated through GSCM. The amount and timing of the rewards that it pays out are dependent on the institutional context and dissemination stage, the match between GSCM and competitive strategy (particularly in logistics/services), and the degree of digital/measurement enablement that makes environmental performance visible and responsive across tiers. I go into great detail about each moderator, describe the processes by which they operate, provide ways to operationalize them, and express claims that may be examined.

2.6.1. Institutional and Diffusion Pressures (early adopters → followers → laggards)

What is this, and why is it like this? The adoption of GSCM (Green Supply Chain Management) and its conversion to performance are both influenced by the coercive (regulatory), normative (industry/professional), and mimetic (competitive imitation) constraints that businesses encounter. With respect to diffusion, those who are considered early adopters frequently pay greater search and coordination costs; nevertheless, they are

also able to reap the benefits of being first to the market, such as preferred-supplier status and learning curves. Followers profit from the availability of defined standards and suppliers who are prepared to meet them; laggards, on the other hand, face the possibility of sanctions and exclusion from the market.

Mechanism of action The prominence of and benefits derived from GSCM are increased by stronger institutional pressure, which is accomplished by (i) improving supply-base readiness (suppliers already have EMS/cleaner processes), (ii) reducing transaction costs for collaboration (shared norms, templates), and (iii) increasing customer willingness to reward environmental performance.

Examples of operationalization

Regulatory stringency: the existence of penalties and punishments, the availability of EPR/WEEE-style obligations, and the frequency of inspections

Market or buyer pressure: the percentage of income from clients that want environmental terms or transparency; membership in industry programs

Diffusion stage: the length of time that has elapsed from the first EMS/ISO 14001; the total number of green joint projects; and self-placement on an adoption curve

Expectation / proposition

The indirect effects of GSCM on economic performance via environmental/operational performance are stronger when institutional pressure is high and among followers operating in mature (diffused) fields, as opposed to laggards or very early, unsupported adoption (Zhu, Sarkis & Lai, 2012, Journal of Engineering and Technology Management, 29(1), 168–185).

2.6.2. Strategy–GSCM Fit (especially salient in logistics/services)

The extent to which green practices support or contradict everyday performance drivers is determined by the extent to which a company's competitive strategy (for example, cost leadership, service dependability, or distinctiveness) is in alignment with its GSCM emphasis. Investments in GSCM (Green Supply Chain Management), such as route optimization, load consolidation, energy-efficient fleets, and packaging redesign, can improve the value proposition in logistics and other services, where asset utilization, service quality, and speed are essential; but, if these investments are not linked properly, they can generate friction and added costs.

Mechanism of action The conversion rate of financial outcomes to eco/operational advantages is increased by strategic fit: when GSCM targets the same levers that the firm competes on, process savings and service enhancements are more easily converted to

monetary value (for example, a reduction in the number of empty kilometers improves both CO_2 and margin).

Examples of operationalization

Fit index: the degree of alignment between the strategy that has been declared and the emphasis of GSCM (for example, GSCM that is focused on efficiency in cost leaders or GSCM that is focused on service/reliability in premium LSPs)
Practice–KPI mapping: the fraction of GSCM efforts that are linked to KPIs that are essential to the plan (OTIF, dwell time, equipment usage, defect rate)

Ase evidence: contracts won/retained that mention green capacity; client groups that reward environmentally friendly features.

Expectation / proposition

The connections between environmental/operational factors and financial factors are greater when GSCM is linked with competitive strategy, with particularly pronounced consequences in logistics service providers (LSPs) and other service-heavy contexts (Laari, Töyli & Ojala, 2018, Business Strategy and the Environment, 27(7), 872–883).

2.6.3. Digital and Measurement Enablement (Green-IS, carbon tracking, visibility)

Environmental flows may be seen and verified across the entire chain by utilizing green information systems (Green-IS), product-level carbon/footprint models, IoT/telematics, and platformed data exchange. Visibility decreases the expenses associated with coordination (who does what, where), assists with real-time optimization (dynamic routing, load planning, energy management), and facilitates credible disclosure (EPDs, scope-3 accounting), all of which are requirements that are increasingly being imposed by buyers and regulators.
Mechanism of action The quality and speed of execution are improved by digital enablement, which improves the a-paths (GSCM → environmental/operational). By allowing businesses to capture and monetize improvements, digital enablement also strengthens the b-paths (environmental/operational → financial) by means of billing rules, incentives, and customer recognition. It also decreases the potential of greenwashing by anchoring assertions in facts that can be traced.
Examples of operationalization
Footprint modeling maturity: use of network-wide CO_2 models, LCA/EPDs at the SKU level (for example, well-known gravity-based or IO-based chain models)

Coverage of data/latency: the percentage of shipments that are equipped with telematics, the percentage of suppliers that provide data regarding activities, and the refresh rate for footprint dashboards

Assurance/standards: reports on scope 3 that have been verified by a third party; compliance with GHG Protocol product regulations

Expectation / proposition

The use of digital/measurement enablement (Green-IS, carbon tracking) intensifies the GSCM → environmental/operational paths and the environmental/operational → financial paths by improving the coordination, accuracy, and credibility of performance signals (Sundarakani et al., 2010, International Journal of Production Economics, 128(1), 43–50).

2.6.4. Putting the conditions together (interaction logic)

Institutional pressure × Digital enablement: Digital traceability becomes a force multiplier in high-pressure contexts—it eliminates reporting frictions and speeds compliance-driven adoption, enhancing both indirect channels.

Strategy fit × Digital enablement: Measurement facilitates the conversion of abstract claims into contractible service level agreements (SLAs) (e.g., emission per delivery, fuel per ton-kilometer) where green capabilities are fundamental to the value proposition (for example, dependable logistics that generate low levels of carbon dioxide). This process simplifies monetization.

Diffusion stage × Strategy fit: Followers in saturated markets will benefit most from a lower strategy fit as it will generate lower implementation costs as their customer expectations are less set. Footloose products on the other hand, are mostly beneficial for early adopters, when fit is strong, because these are the ones who are able to meet the demand of first movers.

2.6.5. Propositions for Process Tracing (aligned with RQ1–RQ2)

Note that the strength of the indirect effects will be contingent upon relevant contextual factors, as the indirect effects (GSCM environmental/operational performance economic/financial performance) is framed in terms of indirect effects . The identification of institutional theory, strategy-practice alignment, and digital enablement makes it possible to use three different perspectives that can help make sense of the variation observed within sectors and firms.

Institutional/Diffusion Effects: On one hand, when institutional pressure and field maturity increase, the indirect effects of GSCM on economic performance through environmental and operational performance continue to grow (i.e., early adopters → quick followers →

laggards).According to institutional theory, coercive (regulatory), mimetic (competition imitation), and normative (professional standards) pressures play a large role in the adoption and performance of GSCM (DiMaggio & Powell, 2000). Zhu, Sarkis, & Lai, 2012 show that companies embedded in mature institutional fields, like those with strong regulatory enforcement, industry or costumer mandates, or widely disseminated practices will generate stronger mediating effects, as environmental and operational improvements become more institutionalized and are perceived by markets.

In the early adoption stages, pioneers are the only companies that invest substantially in GSCM. Also, given the costs as well as limited institutional support, the financial rewards may not be even guaranteed. When influenced by institutions and markets, it is easier for fast followers to translate operational and environmental leadership into financial performance. If implementation is largely symbolic rather than actual, late adopters who take up the practice only when forced to, may be less likely to benefit from smaller forms of mediation. As a result, this thesis explores the conditional nature of the level of indirect impacts in relation to stage and institutional context, finding that levels of impacts must be expected to make use of high regulatory environments, demand, and maturation of industry.

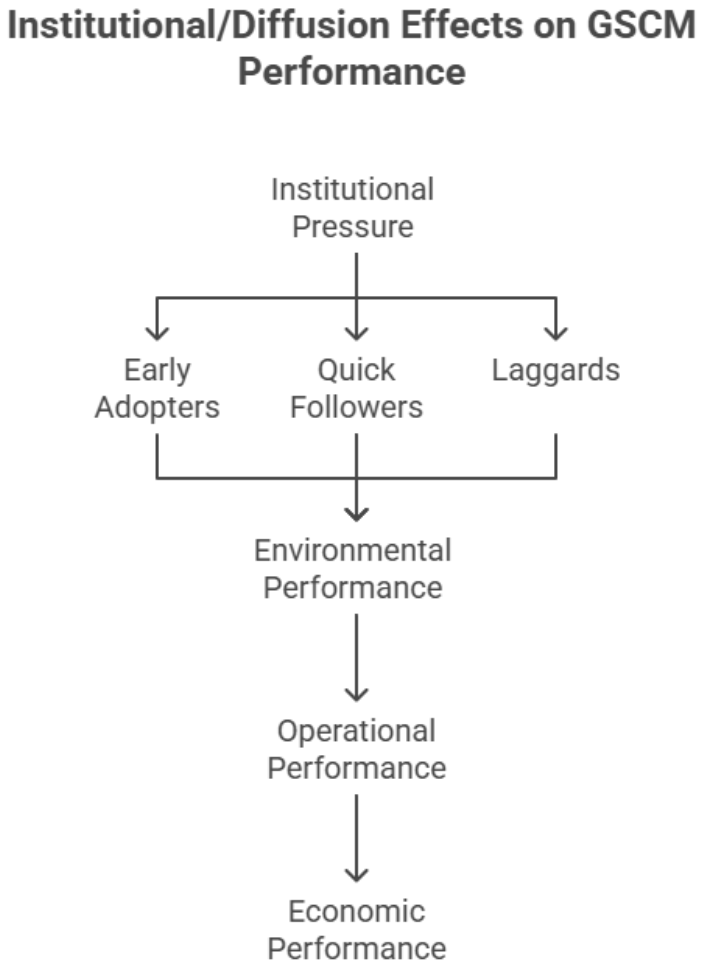


Figure 17 Diffusion Effects on GSCM performance (Author's own work)

"Environmental and operational performance can act as better mechanisms of the efficacy of including the environmental dimension in the GSCM agenda in environments with high levels of institutional pressure and maturity in the field" (Zhu, et al., 2012).

Strategic Fit: Environmental and operational aspects are related to economic aspects in a higher degree when green supply chain management (GSCM) is aligned with the competitive strategy of the firm, especially in logistics and service-intensive firms. In relation to the strategic fit principle, it would apply to the extent in which practices have the highest value when they are consistent with the competitive strategy chosen by a firm. Such strategies could be cost leadership, differentiation, or service excellence. Companies in Logistics and services sectors found it easiest to capture performance from operations and environmental improvements to economic performance when green supply chain management (GSCM) supported their strategic priorities, as Laari, Töyli and Ojala (2018) state. Green logistics for instance allowed third-party logistics services providers to position themselves differently from their competitors, while ecoefficiency was beneficial as a cost leadership in freight and warehousing. Also, for firms concentrating on cost leadership gains in operations like efficiency improvements and defect reduction are directly translated to margins. Practices and policies that are becoming ubiquitous such as eco-labels, green packaging or take-back schemes, begin to differentiate these brands from other brands and provide them access to other markets. In service sectors like logistics, banking or Information technology services, green supply chain management needs to be integrated with digital logistics or green branding which will help in increasing customer loyalty and reputation based benefits.

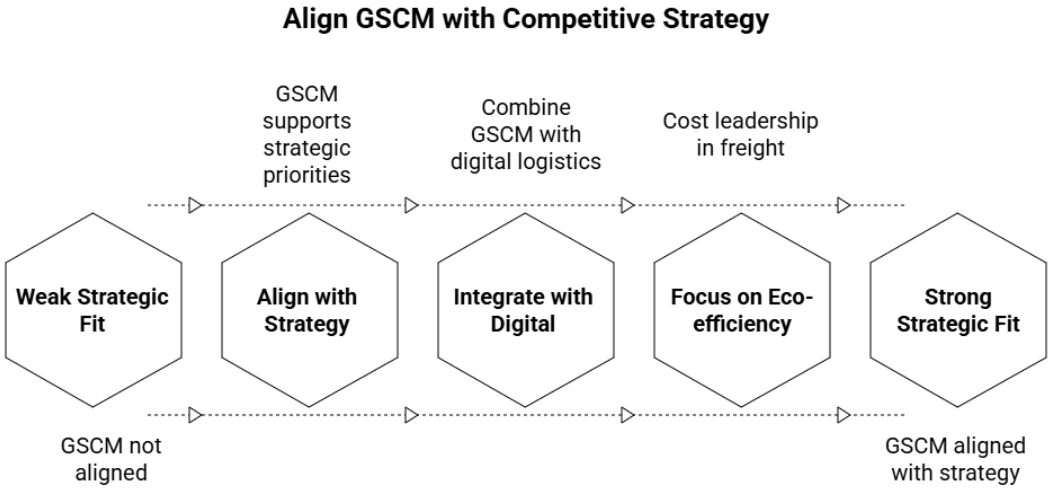


Figure 18 GSCM with Competitive Strategy (Author's own work)

"*The more that GSCM is integrated with the competitive strategy of a firm, especially firms in the logistics or services industries, the stronger the mediating effect of environmental or operational performance on firm financial performance*"(Laari et al., 2018)

Green-IS/Digital Enablement: Capabilities for measuring the environment and of Green IS support both (GSCM → environmental/operational) and (environmental/operational → economic), thus increasing the strength and significance of the indirect effects. More and more nowadays, it is recognized that digital technologies are enablers for GSCM (Sundarakani et al., 2010). Carbon tracking dashboards, blockchain-based traceability, and aggregated sustainability reporting are forms of Green-IS that strengthen coordination and legitimacy along supply chains. In addition, Green-IS increases the cognizance and credibility of environmental and operational benefits on the b-paths (performance → economic outcomes) when it helps in "making data-driven decisions, increased collaboration among suppliers, having adequate monitoring of eco-design, reverse logistics, customer collaboration, and a-paths (GSCM → performance). This credibility increases market value awareness, CC competitive edge, therefor also increasing costs, all of which increase the likelihood of performance improvements successfully translating into pecuniary returns. The use of digital technology can also help alleviate the risks associated with greenwashing by reducing asymmetries in information that allow stakeholders to believe in the benefits that have been recorded. This becomes even more important in an institutional context, where environmental, social, and governance (ESG) reporting and disclosure are increasingly becoming mandatory.

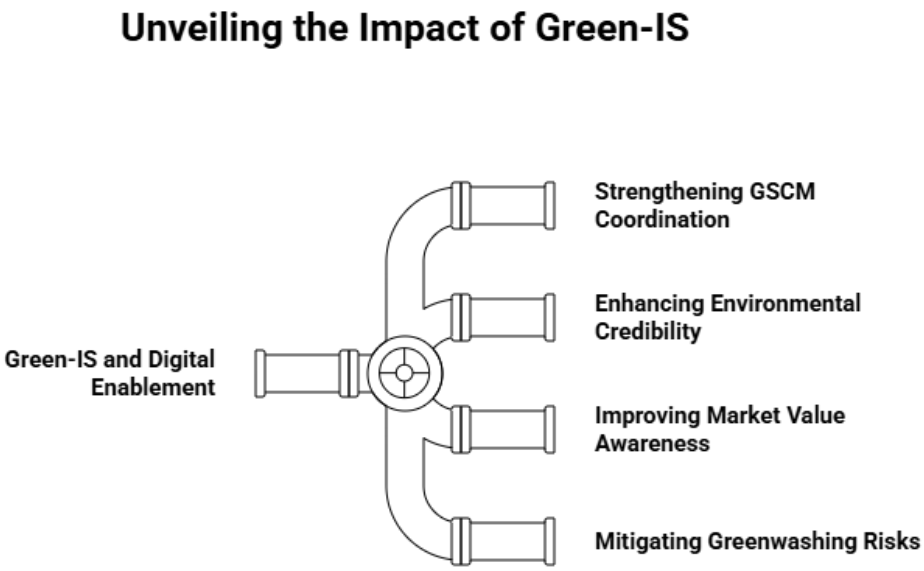


Figure 19 Unveiling the Impact of Green- IS (Author's own work)

"Green-IS and eco-measurement capacities have been shown to enhance both the adoption of GSCM activities as well as the transformation of environmental/operational benefits into financial benefits leading to stronger mediation effects" (Sundarakani et al., 2010).

2.7. Practice-Specific Insights (deepens RQ2)

This section crystallizes when and why each GSCM practice is likely to convert EP and OP enhancement to actual economical/reputational improvements. The business case is mostly indirect (practices → EP/OP → outcomes) across studies with varying effect sizes and timelines based on practice bundle and context.

2.7.1. Eco-design and Upstream Collaboration

According to the research, eco-design (ECD) in conjunction with early supplier participation results in significant environmental performance (EP) advantages (such as decreased material/energy intensity, fewer toxics, and simpler disassembly) and operational performance (OP) improvements (such as greater yield/FPY, less scrap, and shorter cycle times). These procedures often result in cost reductions and margin improvements, which then indirectly translate into economic or financial consequences. The design/upstream cluster is classified as one of the stronger practice families for performance impacts through EP/OP based on meta-analytic data.

Key approaches include incorporating environmental standards throughout design gates, supplier co-development, modularity and design-for-X, and Green-IS, which records eco-metrics across gates and certifies changes.

2.7.2. Customer Collaboration (Downstream)

What it is? Customer collaboration means working with downstream partners to co-specify greener products, packaging, logistics options, and—where relevant—take-back/after-market arrangements across the product life cycle. Prior work shows downstream collaboration is a core GSCM dimension and is consistently associated with better market, operational, and accounting outcomes—typically indirectly via environmental and operational improvements rather than as a large stand-alone effect. In this thesis we therefore treat customer collaboration as a conversion mechanism that helps translate environmental (EP) and operational (OP) gains into economic/competitive results. See synthesis/meta findings and classic collaboration studies. (Meta-analysis: Golicic & Smith, 2013; collaboration-performance: Vachon & Klassen, 2006, 2008; mediation via EP/OP: Feng et al., 2018).

How it creates value (qualitative mechanisms)

Environmental credibility route (EP → selection advantages). Joint LCAs, shared scope-3 data, eco-labels, and audit-ready dashboards make environmental improvements visible and verifiable for buyers, reducing perceived risk and enabling ESG-weighted procurement preferences (short-list access, score gains, sometimes premiums). This aligns with SSCM's emphasis on credible environmental information for market conversion. (Seuring & Müller, 2008; Vachon & Klassen, 2008).

Operational service route (OP → cost/reliability advantages). Co-designing packaging and delivery specifications with customers reduces damage and returns, improves OTIF, and stabilizes throughput/unit cost—raising the value of OP gains and making them legible to the customer. Prior studies document downstream collaboration links to service reliability and internal efficiency. (Vachon & Klassen, 2006; Feng et al., 2018).

Category advantage route (market conversion). In categories where tenders explicitly weight environmental criteria (public procurement, construction, large OEMs), customer collaboration converts EP/OP into access and preference (short-lists, score uplifts, sometimes price realization). (Seuring & Müller, 2008; Badi & Murtagh, 2019).

Key boundary conditions

Strategic fit (what the firm competes on). Collaboration pays most where the target segment values environmental performance (supplier sustainability ratings, tender rules). Where segments are price-dominant and ESG is weak, EP/OP improvements remain internal savings with limited market lift. (Laari, Töyli & Ojala, 2018,).

Measurement credibility / Green-IS. Without trustworthy, shared metrics, buyers discount claims. Green-IS capabilities (traceability, dashboards, validated KPIs; API feeds from

EMS/WMS/TMS) strengthen both practice→EP/OP formation (coordination) and EP/OP→outcome conversion (credibility). (Bokolo, 2019; evidence compendium in GSCM–performance: Feng et al., 2018).

Institutional setting. ESG-weighted procurement rules and buyer audits formalize how verified EP/OP improvements affect award decisions—particularly salient in construction/public sectors. (Badi & Murtagh, 2019).

What to capture (qualitative indicators & artifacts)

Practice evidence: co-design of packaging/eco-features; shared LCA/scope-3 datasets; eco-labels or EPDs; client sustainability scorecards; agreed take-back loops for packaging/parts; collaboration forums (S&OP + sustainability workstreams). (Green et al., 2012).

Mechanism evidence (EP/OP): emissions/energy/waste intensity per shipped unit; damage/return rate; OTIF; logistics unit cost; cycle time for key accounts—time-stamped to show EP/OP changes preceding outcomes. (Feng et al., 2018).

Outcome evidence: unit margin/cost-to-serve; preferred-supplier listings; tender wins/score deltas in ESG-weighted accounts; share growth in green-sensitive segments. (Meta pattern: Golicic & Smith, 2013).

Risks and how to manage them

Audit/documentation burden. If process ownership and IS are weak, collaboration costs can outweigh benefits. Mitigations: standardize templates; focus on a few buyer-linked KPIs; automate data capture via ERP/WMS/TMS/IoT interfaces. (Bokolo, 2019).

Uncertain "green premium." Premiums are segment-specific and evaporate without verification. Mitigations: target ESG-weighted segments; use third-party assurance of KPIs/labels. (Seuring & Müller, 2008; meta patterns on market outcomes).

Over-customization. One customer's bespoke packaging/logistics can add complexity. Mitigations: modular "menu of green options" and platform packaging standards agreed with multiple customers. (Collaborative design guidance in the GSCM literature).

How we will study it (qualitative method)

We will trace (not test) how customer collaboration enables Practice → EP/OP → Outcome chains by: (i) building timelines of collaboration episodes (pilot → routinized → scaled); (ii) triangulating interviews, buyer documents (scorecards, tender criteria, MOUs) and KPIs; (iii) conducting rival-explanation checks (price/mix, capex, macro shocks); and (iv) cross-case pattern matching to see when strategic fit and measurement credibility accelerate conversion. This approach aligns with prior evidence that downstream collaboration relates positively to

performance while the economic payoff is largely mediated by EP/OP. (Feng et al., 2018; Golicic & Smith, 2013; Seuring & Müller, 2008).

Note on measures: We will adapt customer-collaboration items from established GSCM scales (e.g., joint eco-packaging, verified environmental data sharing, co-designed logistics specifications, take-back arrangements) to structure interviews and document collection, keeping the analysis strictly qualitative in this thesis. (Green et al., 2012)

"In export settings, downstream collaboration often links directly to tender eligibility and preferred-supplier lists when paired with auditable metrics." (Laari et al., 2018)

2.7.3. Reverse Logistics and Closed-Loop Supply

What it is (scope and mechanisms) RL/CLSC covers the collection, inspection, grading, and recovery of value from returns or end-of-life (EoL) goods—repair, refurbish, remanufacture, recycle—and the reinjection of components/materials into the forward chain. In a mediated value logic, RL/CLSC primarily improves environmental performance (EP) by diverting waste and reducing virgin inputs, and operational performance (OP) by stabilizing parts availability and buffering variability; these EP/OP mechanisms then convert (often with a lag) into economic outcomes such as recovery margin and avoided input/landfill costs, and—where buyers value circularity—reputational/market benefits. This ordering is consistent with SSCM's view that environmental/operational results emerge first and economic payoffs are mainly indirect (Seuring & Müller, 2008; Govindan, Soleimani, & Kannan, 2015,).

How design & governance drive results, Network architecture under uncertainty. RL/CLSC must handle stochastic timing, volume, and quality of returns. High-performing designs use proximal collection and sorting hubs, capacity buffers, and graded flows (A/B/C quality) so items route quickly to the economically dominant option (repair → reman → recycle → safe disposal). Location–allocation, capacity, inventory, and routing decisions materially affect EP (transport emissions, diversion rates) and OP (lead time, throughput). Robust designs often draw on stochastic/fuzzy formulations to hedge uncertainty (Govindan et al., 2015). Product design for recovery. Modularity and design-for-disassembly reduce inspection/take-down costs and raise yields into higher-value paths (reman vs. recycle). Early EoL planning—"choice of recovery" at the design stage—improves both EP and value capture (Seuring & Müller, 2008).

Contracts & incentives. To prevent leakage/cherry-picking, leading loops use incentive-compatible contracts with 3PLs/collectors/refurbishers (e.g., revenue-sharing tied to recovered quality/quantity, quality credits, service-level clauses for cycle time). Where policy applies, EPR-shaped arrangements align actors; fair-allocation schemes (e.g.,

Shapley-style) can stabilize cooperation—governance quality is a first-order driver of realized recovery value (Govindan et al., 2015).

Information systems & traceability (Green-IS). Item-/batch-level traceability and LCA-linked dashboards cut decision latency (faster routing), reduce dead-haul, and provide verifiable EP metrics—thereby strengthening both the practice → EP/OP links and the EP/OP → outcome conversion where buyers/regulators reward credible evidence. Green-IS studies consistently show that IS competence + institutional pressure + strategy jointly lift environmental results (see integration of Green-IS with GSCM practice bundles in the literature).

What to measure (qualitative indicators for EP/OP → outcomes), Practice evidence (RL/CLSC): presence/scale of take-back; quality grading rules; repair/reman lines; traceability systems; revenue-sharing/performance contracts; proximity sorting hubs. (Green et al., 2012.)

EP (mechanisms): diversion rate (%); recycled content (%); virgin-material intensity (kg/unit); GHG per recovered unit; hazardous-waste incidents.
OP (mechanisms): OTIF for service parts; return-to-decision time; reman cycle time; damage/obsolescence rate; inventory turns on recovered stock.
Economic/market (outcomes): recovery margin (€/unit processed); avoided input/landfill costs; changes in ROA/ROS attributable to recovery; tender wins/preferred status where circular KPIs are scored (Feng et al., 2018).

Method note (qualitative): we collect triangulated evidence (interviews + documents + KPIs) and keep the result ordering explicit—EP/OP as proximal mechanisms, outcomes as converted effects—assessing each link's strength (Strong/Moderate/Tentative).

Key contingencies & conditions (why conversion varies), Institutional & diffusion context. EPR rules, buyer audits, and mature secondary markets raise adoption and tighten conversion by rewarding verified EP/OP gains; where enforcement/markets are weak, conversion lags (Zhu, Sarkis, & Lai, 2012; Govindan et al., 2015).

Strategic fit. Payoffs are higher when RL supports the category strategy (e.g., service continuity for spares; circular claims valued by customers). In commodity settings with thin secondary markets, economic gains are delayed/subdued—you still get EP/OP improvements, but conversion depends on channels and pricing (Seuring & Müller, 2008).

Green-IS / digital enablement. Credible measurement (condition data, yields, carbon per pathway) and shared dashboards reduce information frictions and scale practices across partners—an amplifier of both mechanism formation and conversion (Feng et al., 2018).

Sector note: Construction , Fragmented supply bases and one-off projects mean contract form drives outcomes. Embedding whole-life carbon and recovery value into bids and contracts (alliances/PPPs, material passports) internalizes benefits that otherwise leak, allowing EP/OP gains to convert to economic results. Without contract-embedded circularity, loops break and payoffs remain latent (Govindan et al., 2015; Seuring & Müller, 2008).

Practical design checklist , component labelling, design for disassembly, clear return-quality classes and tests.

- Network: combined forward–reverse routing where feasible; localized collection/sorting; pre-sort to avoid dead-haul; size buffers for expected return variability.
- Governance: performance-linked revenue sharing; quality credits; cycle-time SLAs; fair-allocation methods in multi-party loops.
- IS & analytics: item-level traceability; dashboards tying recovery decisions to EP and €; scenario tools for uncertainty; use of stochastic/fuzzy/DEA/QFD-LPP toolkits as appropriate (Govindan et al., 2015).
- Mindset: treat RL/CLSC as a capability system—payoffs are design- and governance-sensitive.

Bottom line for a qualitative thesis, In our cases we trace the chain RL/CLSC → EP & OP → outcomes with timelines, triangulated evidence, and rival-explanation checks. We expect strong indirect effects (via EP/OP) and context-dependent conversion: faster where institutional pressure + verification exist, where strategic fit is clear, and where digital measurability is high—especially when contracts price whole-life carbon and recovery value. This is fully consistent with the mediated business case reported in prior work (Feng et al., 2018; Seuring & Müller, 2008; Govindan et al., 2015; Zhu et al., 2012).

Visual summary of practice effects:

Practice	**Primary mechanisms**	**Economic realization**	**Key contingencies/enablers**	**Governance/IS notes**
Eco-design + Upstream Collaboration	Environmental (emissions, waste, energy) & Operational (yield, scrap↓, cycle time↓)	Cost savings, margin via material/energy cuts; later price/volume effects in green segments	Supplier early involvement; design-for-X; Green-IS at design gates; strategic environmental/supply chain orientations	Shared specs & LCA data; cross-functional gates; supplier codes; audited metrics

Customer Collaboration (downstream)	Environmental credibility & Operational service reliability	Access to tenders, preference, premiums—when aligned with segment buying criteria	Strategic fit; verified KPIs; disclosure (scope-3, LCA); segment values sustainability	Joint scorecards; data-sharing agreements; eco-label verification
Reverse Logistics / CLSC	Environmental (waste diversion, virgin input↓) & Operational resilience (spares, lead-time)	Recovery value, avoided material cost; depends on secondary markets & quality grading	Network design; EPR/returns policy; product modularity; proximity sorting hubs	Incentive-compatible contracts; item-level traceability; choice-of-recovery decision rules

Table 4 Practice → Mediator → Outcome matrix with contingencies and governance/IS notes.

2.7.4. Cross-cutting Patterns and Implications for RQ2

Indirect impacts are more significant than direct effects: The overall effects of GSCM on the performance of the firm are substantial, and the majority of these effects are mediated by EP and/or OP.

Make use of complementary practices: upstream (ECD, supplier cooperation) and downstream (customer collaboration, investment recovery) mutually support each other (for example, design-for-recovery makes RL more cost-effective, and validated EP/OP permits market access).

Enablers: Strategic orientations (supply chain/environmental) and Green-IS magnify both a-paths (to extended production/operation) and b-paths (from extended production/operation to economic results).

Sectoral nuance: In construction and other project-based contexts, performance payoffs depend on end-to-end integration and contract design that values whole-life carbon and recovery value.

2.8. Sector & Context Notes (keeps findings honest for RQ1–RQ2)

Why it is important to read this section? The amount of GSCM payoffs, as well as the direction that they take, are contingent upon the industry that is being studied (manufacturing vs logistics/services), as well as the location of the enterprises that are operating (institutional

strength, infrastructure, buyer expectations). I will summarize what the research has to say and explain what to look out for when evaluating questions 1–2 in the following paragraphs

2.8.1. Manufacturing vs. logistics/service: different levers, different frictions

Manufacturing

Operational logic**:** As a result of the fact that plants transform GSCM most immediately into process improvements, such as decreased scrap and rework, improved first-pass yield, and reductions in energy and material intensity, benefits often surface first in operational measures, and later in accounting metrics as cost savings build. This particular sequence serves as the foundation for the mediation logic that you do (GSCM → environmental/operational → financial).

Where it varies: A number of factors influence the magnitude of the effect, including the kind of process (discrete vs process industries), the product design latitude (eco-design options), and the supplier depth (tier-2/3 visibility). Compliance with environmental regulations is already a hygiene issue in businesses that are heavy or regulated, such as the chemical and metal industries. Incremental benefits are still important, although they may be smaller and more difficult to achieve.

Logistics/services

Operational logic**:** In situations when GSCM is strategy-congruent, such as when route optimization, load consolidation, and energy-efficient assets concurrently reduce carbon dioxide emissions while simultaneously improving utilization, on-time dependability, and cost per ton-kilometer, LSPs and service-heavy settings emerge victorious. In situations when green initiatives are not in line with the plan (for example, expensive retrofits that do not affect service KPIs), payoffs are reduced.

Evidence:. GSCM was found to improve both environmental and financial results in a multi-country LSP sample. The effects were more pronounced when aligned with competitive strategy (for example, cost/efficiency versus service differentiation), which is a classic fit moderator (Laari, Toyli, and Ojala, 2018, Business Strategy and the Environment, 27(7), 872–883).

Measurement nuance: At the cargo or lane level, several logistics service providers (LSPs) publish eco-metrics (gCO2e per delivery/ton-km). As a result of these data, the operational to financial link (fuel, equipment usage) is sharpened, which makes it simpler to spot indirect impacts than it would be in industrial settings with complicated basis of materials (BOMs).

Concluding remarks: In the process of reporting RQ1 (does GSCM pay?) and (mediation), you should either split manufacturing cases from logistics and service cases or add a sector dummy or multi-group test report. When efforts are aimed at core service key performance indicators (KPIs), when it comes to logistics, you should anticipate larger and quicker operational mediation; when it comes to manufacturing, you should anticipate stronger eco-design channels.

2.8.2. Country/region nuances: institutions, infrastructure, and market expectations

Türkiye (illustrative)

Recent findings from Turkey indicate that increasing environmental performance (EP) does not necessarily result in a rise in competitive advantage. Rather, green innovation (GI), which refers to the introduction of new or redesigned goods or processes that include environmental thinking, is responsible for bringing environmental performance advantages into areas of competitiveness. In a nutshell, the relationship between EP and GI is a competitive advantage, and the direct correlation between EP and advantage is either weak or non-significant, as stated (Gelmez, Özceylan & Mrugalska, 2024, *Sustainability*, 16(22), 9757). Why that makes perfect sense? The key bridge to advantage is skills that turn environmental performance into marketable products (eco-features, lighter packaging, and circular services). This is especially true in environments where regulation is inconsistent and eco-labels and green premiums are still in the process of spreading. It is possible for businesses to "look greener" internally without having GI (or buyer programs that identify EP), but they will not be able to turn it into market outcomes.

Broader differences across regions

A reverse flow infrastructure that is in place. while take-back, repair/remanufacturing, and material recovery networks are established (in the European Union and certain regions of East Asia), investments in reverse logistics convert to financial value more quickly. On the other hand, while networks are still in their infancy, you should anticipate latencies and leakage, which will reduce the b-paths to accounting results.

Buyer pressure and public procurement are two important factors. Verifiable EP is rewarded in regions that have a high concentration of original equipment manufacturers and merchants or strong public procurement requirements; the quality of disclosure (EPDs, scope-3) is important for entry to bids.

Distributing the standards. High ISO-14001/EMS coverage among suppliers helps to eliminate frictions in collaboration, which in turn strengthens a-paths (also known as GSCM, which stands for environmental/operational).

Implication for RQ2: GI should be treated explicitly in national contexts such as Turkey, either as a component of eco-design or as a competency that complements eco-design, because it acts as a mediator between environmental performance and competitive results. In the process of interpreting null or minor direct EP → performance linkages, it is important to investigate if buyer recognition or GI intensity is present.

2.8.3. Cross-cutting synthesis: how sector and setting shift each RQ

RQ1 (Does GSCM pay?) While the reward magnitude is dependent on sector levers, the answer is yes on average: Utilization, time, and dependability are the three factors that determine the profitability of logistics and services. Manufacturing benefits are dependent on eco-design and process efficiency. "Tailwinds" (infrastructure, buyer pressure) can be added or removed depending on the country settings. The market, operational, and accounting buckets may be used to reveal where the effects are located.

RQ2 (Which practices matter?) In the manufacturing industry, eco-design and supplier collaboration frequently take the precedence; IEM is the enabler. IEM for fleet and terminal operations, measurement and digital technologies that relate carbon dioxide to cost and service, and customer collaboration in the realm of logistics and services (including packaging and consolidation).

RQ1 (Mediation) Which stands for "Mediation." In LSPs, you may anticipate that operational mediation will be more effective and efficient, while environmental mediation will be strengthened in situations where transparency is rewarded. In circumstances that are similar to Turkey, it is recommended to incorporate a GI mediator in order to accurately portray the EP → GI → benefit chain, as stated by Gelmez et al. in 2024.

RQ2 (Boundary conditions) The alignment of strategy and GSCM is of critical importance in the service industry (Laari et al., 2018). As a result of institutional and diffusion pressure, as well as digital and measurement enablement, indirect effects are amplified in both industries; however, they are more significant in situations where buyer scrutiny is strong and networks are abundant in data.

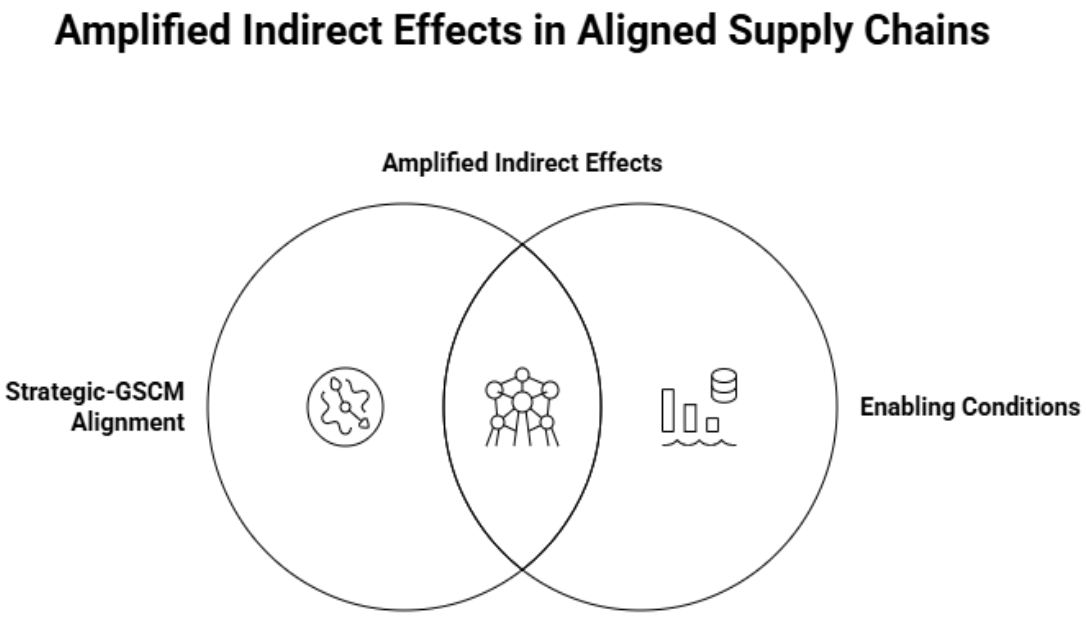


Figure 20 Amplified indirect effects in aligned supply chains (Author's own work)

2.9. Synthesis → Explicit Gap

When the review is taken as a whole, three themes jump out: what we already know works, when the findings are different, and specifically what this thesis will offer.

2.9.1. Consistent patterns (the mediated pathway is robust)

Across quantitative syntheses and validated survey models, the business case for GSCM is positive on average, but it is not direct—it typically flows through environmental and operational performance before showing up in accounting/financial outcomes. Meta-analytic evidence aggregates many settings and finds that GSCM relates positively to market**,** operational, and accounting results (Golicic & Smith, 2013, *Journal of Supply Chain Management*, 49(2), 78–95,). Firm-level models using a standard five-practice bundle (internal environmental management, green purchasing/supplier collaboration, eco-design, customer collaboration, reverse logistics) repeatedly show partial—and sometimes full—mechanism chain environmental and operational improvements (Green, Zelbst, Meacham, & Bhadauria, 2012, *Supply Chain Management: An International Journal*, 17(3), 290–305). In short: GSCM → (environmental/operational gains) → economic performance is the modal pathway.

*"*Reporting outcomes in market/operational/accounting buckets keeps our findings comparable to meta-analytic evidence." (Golicic & Smith, 2013)

2.9.2. Contradictions and contingencies (context and practice mix matter)

Findings diverge when you vary industry, region, institutional pressure, competitive strategy, and digital/measurement maturity**.** In logistics/services, payoffs strengthen when green initiatives are aligned with the provider's competitive strategy (e.g., load consolidation and route optimization improve both CO_2 and utilization/reliability), whereas off-strategy projects struggle to monetize gains (Laari, Töyli, & Ojala, 2018, *Business Strategy and the Environment*, 27(7), 872–883). Diffusion dynamics also shift adoption costs and benefits: early adopters face higher search/coordination costs but can earn first-mover advantages; followers benefit from supplier readiness and clearer buyer expectations; laggards risk exclusion—implying that institutional pressure and field maturity moderate both adoption and payoffs (Zhu, Sarkis, & Lai, 2012, *Journal of Engineering and Technology Management*, 29(1), 168–185). Finally, payoffs depend on the practice bundle: internal systems alone are rarely sufficient; bundled adoption (IEM + supplier/customer collaboration + eco-design + reverse flows) yields larger and more reliable effects than isolated actions (Green et al., 2012; Golicic & Smith, 2013).

"Differences in effect size are consistently linked to sector/region, practice maturity/bundling, and the credibility of digital measurement." (Seuring & Müller, 2008; Laari et al., 2018).

2.9.3. The explicit gap this thesis will fill (what we will trace and how it adds value)

Despite strong average evidence, three gaps remain where your study can move the needle:

Practice-specific pathways with qualitative depth**.** We lack fine-grained, cross-case detail on *how* each practice (e.g., supplier collaboration vs. eco-design vs. reverse logistics) actually produces environmental and operational gains that translate into economics in specific contexts. This thesis will trace mechanisms practice-by-practice using documentary/archival sources (and, where feasible, triangulated evidence), linking them explicitly to environmental and operational mechanisms before economic outcomes (anchored to Green et al., 2012).

Boundary conditions: strategic fit and digital/measurement enablement (qualitative framing). Rather than testing coefficients, we examine—case by case—how well GSCM routines align with what the firm actually competes on (strategic fit) and how credible/usable its Green-IS & measurement systems are (traceability, carbon/EP dashboards, operational KPIs). We then trace whether these two conditions (i) help practices *produce* clearer environmental/operational mechanisms (e.g., waste/energy intensity down; FPY up; cycle time down) and (ii) help those mechanisms *be recognized and rewarded* as economic or reputational outcomes (cost savings, recovery value, tender wins). Concretely, we will code: evidence of strategy–GSCM alignment in plans and buyer scorecards; the maturity of data systems (from ad-hoc spreadsheets to audited, shareable dashboards); and instances where

verified metrics accelerated buyer acceptance or internal investment. Using timelines, triangulated evidence, and cross-case pattern matching, we expect stronger "practice→mechanism" links and faster "mechanism→outcome" conversion when fit is high and measurement is credible—consistent with prior large-sample indications that strategy and information capability condition GSCM payoffs (Laari, Töyli, & Ojala, 2018; Zhu, Sarkis, & Lai, 2012)

Completing the evidence triangle for RQ1–RQ2 with clear reporting buckets. Meta-analytic conclusions are strong at the aggregate level (Golicic & Smith, 2013,), but managers need contextualized guidance. This thesis will report outcomes in the three meta-analytic buckets—market, operational, accounting—and explicitly state when and why magnitudes differ (industry/region, practice mix, maturity). That makes the findings comparable to the quantitative literature while adding explanatory richness.

"This thesis will trace practice → EP/OP → economic/reputational links in Bangladeshi garments, and test plausibility against conditions (buyer pressure, strategy fit, digital enablement) using within-case evidence and a cross-case matrix." (Green et al., 2012; Golicic & Smith, 2013; Zhu et al., 2012).

2.9.4. What, specifically, this thesis will trace

Mediated pathway: How environmental and operational performance carry practice effects to economic/reputational outcomes in the focal context(s), and when any direct-looking links appear after mechanisms are evidenced (Green et al., 2012; Golicic & Smith, 2013).

Conditions : Whether institutional/diffusion pressure and strategy–GSCM fit (especially in logistics/service settings) strengthen the indirect effects, and whether digital/measurement enablement further amplifies conversion of environmental/operational gains into economic outcomes (Laari et al., 2018; Zhu et al., 2012).

Practice-level effects (RQ2**):** Which practice bundles (IEM; supplier/customer collaboration; eco-design; reverse logistics) are most influential in generating environmental/operational improvements in the studied sector(s), and how those improvements show up in market**,** operational, and accounting buckets (Green et al., 2012; Golicic & Smith, 2013).

Deliverable for readers. A transparent map: (a) what practices were present and to what maturity; (b) which environmental/operational improvements were evidenced; (c) how those mapped into market/operational/accounting outcomes; and (d) how context

(strategy fit, institutional pressure, digital enablement) amplified or muted each link. This closes the gap between aggregate claims and case-level causality, while staying anchored to the strongest quantitative evidence to date (Golicic & Smith, 2013; Green et al., 2012; Laari et al., 2018; Zhu et al., 2012).

Figure 21 Achieving Sustainable Economic Outcomes (Author's own work)

2.10. Summary Table for Literature Review

Study (year) & DOI	Setting / Sample	GSCM scope (typical practices)	Method	Key findings (effects & mediation)	Notes/conditions / implications
Green, Zelbst, Meacham & Bhadauria (2012) — https://doi.org/10.1108/13598541211227126	US manufacturing (n=159 managers)	IEM, Green IS, GP, Customer coop., Eco-design, Invest	SEM	GSCM → EP & economic; EP & economic → OP; OP → org performance. Two-wave implementation logic (internal capabilities/IS	Early integrated model showing indirect value creation through EP/OP; positions

		ment recovery		precede external practices).	Green-IS as precursor.
Golicic & Smith (2013) (meta-analysis) — https://doi.org/10.1111/jscm.12006	20+ years of studies; cross-industry	Upstream, design, production, downstream	Meta-analysis	Overall positive, significant links to market/operational/accounting performance; effects vary by practice type, industry, region.	Supports business case; underscores contextual conditions (industry/region/time).
Abdallah & Al-Ghwayeen (2020) — BPMJ https://doi.org/10.1108/BPMJ-03-2018-0091	Jordan manufacturing (n=215)	Eco-design, GP, Customer coop., IEM	SEM	reported no remaining direct effect once EP/OP mechanisms were accounted for.	Textbook full mediation case in a developing-country context.
Sahoo & Vijayvargy (2021) — JMTM https://doi.org/10.1108/JMTM-04-2020-0173	India manufacturing (n=160; multiple sectors)	IEM, GP, Customer coop., Eco-design, Investment recovery	SEM	Most practices improve EP/OP; economic performance improves indirectly (via EP/OP). Eco-design → OP; investment recovery → EP.	Practice-specific effects; aligns with partial/indirect payoff logic.
Kirchoff, Tate & Mollenkopf (2016) — IJPDLM https://doi.org/10.1108/IJPDLM-03-2015-0055	US managers (n=367)	Broadly integrative GSCM capability	SEM (RBT + SCT)	Supply chain orientation & environmental orientation → GSCM → performance. Capability bundle must adapt to environment.	Shows strategic orientations as antecedents; supports adding EO/SCO to your model.
Govindan, Soleimani & Kannan (2015) —	382 papers (2007–2013)	Reverse	Systematic	RL/CLSC now a value &	Suggests RL/CLSC

EJOR (RL/CLSC review) https://doi.org/10.1016/j.ejor.2014.07.012		logistics / closed loop	review	revenue opportunity; outcomes depend on network architecture & governance.	→ EP & OP, then economics when modularity/ secondary markets exist.
Badi & Murtagh (2019) — JCP (construction SLR) https://doi.org/10.1016/j.jclepro.2019.03.132	44 papers (to 2017)	Construction GSCM	Systematic review	Calls for end-to-end perspective; sector-specific constraints; emphasizes operational tools + policy pressure.	Sector nuance: project governance & lifecycle lock-in shape EP→OP→ economic translation.
Bokolo (2019) — BIJ (Green IS) https://doi.org/10.1108/BIJ-05-2018-0142	Organizations (survey)	Green IS (pollution prevention, stewardship, clean development)	PLS-SEM; BAO + NRBV	IT exec/professional beliefs + Green-IS integration → EP. Institutional pressure & strategy matter.	Supports digital enablement as moderator/ enabler of a- and b-paths in your model.
Yang & Singhdong (2024) — JILT (conceptual) https://doi.org/10.1108/JILT-07-2023-0056	Conceptual (emerging economies)	Green supply chain integration (GSCI)	Conceptual SLR	Proposes GSCI → Enterprise performance via ambidextrous green innovation; green legitimacy moderates.	Opens a mechanism via innovation (parallel to EP/OP mediation).
Gelmez, Özceylan & Mrugalska (2024) — Sustainability https://doi.org/10.3390/su16229757	Türkiye plastics/packaging/textile (n=283)	GSCM (five-dimension view)	SEM	GSCM → GI & EP & CA; GI → CA; EP ↛ CA.	Highlights innovation as a stronger commercial

					bridge than EP alone.
Visamitanan & Assarut (2024) — Global Business Review https://doi.org/10.1177/09721509211018569	Thailand employees (n=268)	9-practice GSCM scale	PLS-SEM	GSCM → firm social/operating performance → employee engagement/commitment (environmental/marketing performance did not mediate).	Extends outcomes to people metrics; supports adding social/HR pathways.
Zhang, Panichakarn & Shen (2025) — J. Chinese HRM (China–Laos Railway) DOI in paper	Megaproject context (n=211)	GHRM + GSCM	SEM	Both GHRM & GSCM → sustainable performance; ESRP mediates; GSCM strongest direct effect.	Shows HR + SC complementarities; aligns with SDG framing & institutional pressures.

Table 5 Summary Table for Literature Review

3. METHODOLOGY

In this chapter the research methodology, methods and procedures employed to investigate how Green Supply Chain Management (GSCM) practices influence organizational performance in the Bangladeshi garments manufacturing industry are described. This chapter aims to explain the processes of designing the study, collecting and analyzing the data, ensuring the validity of the study and maintaining ethical considerations.

Since this was exploratory research, a qualitative multiple-case study method was used to attain an in-depth and contextual understanding of how firms adopt green practices and how these green practices affect environmental, operational, and economic performance. Plus, the chapter outlines the overall sampling strategy, the devices used for data collection, data analysis, and the tools used to manage and analyze the data.

3.1 Research Design

This dissertation takes the form of a qualitative, comparative, multiple-case study to trace the mechanisms connecting GSCM practices with outcomes. Rather than statistical effects, the study brings specific instances of practice to bear on environmental/operational (EP/OP) changes, and, in some cases, economic/reputational outcomes. A cross- case logic, given the two apparel firms are in different maturity or contexts, allows for analytical generalization to mechanisms and conditions (buyer pressure, strategy fit, digital/measurement enablement) rather than to populations..

3.2 Research Approach

This study is conducted using an inductive logic, which places more of an emphasis on theory-building and discovery than it does on testing hypotheses. By conducting interviews and doing document analysis, observations are made on the manner in which businesses incorporate environmental objectives into supply chain operations and the manner in which performance results arise as a result of environmental and operational mediation. The Bangladeshi export-garment context—characterized by buyer audits, certification regimes, and cost pressure—provides a strong setting to observe how practice bundles travel through EP/OP before converting (or not) to market/economic outcomes. The Bangladeshi export-garment context—characterized by buyer audits, certification regimes, and cost pressure—provides a strong setting to observe how practice bundles travel through EP/OP before converting (or not) to market/economic outcomes.

3.3 Case Selection

We also identified two apparel producers that are divergent in terms of GSCM maturity level (capability driven versus buyer driven), digital enablement, such as dashboarding/traceability versus manual reporting, and the diversity of environmental strategies such as IEM/supplier and client collaboration, eco-design and reverse logistics. Practical considerations included access (to obtain managers permission and permission for documents), data richness (either informants or trace files), and contrast (in order to quantify patterns across cases) and patterns. This difference allows some of those mechanisms that seems to be particularly strong and some contexts which may prevent or support conversion to economic/reputation outcomes.

3.4 Participants

In order to guarantee complete understanding of the GSCM process, from environmental policy to the operations, two key informants were interviewed from each organization. Participant details can be found in the Table.

Company	Participant	Position / Role	Key Focus Area
Company X	A	Environmental / Sustainability Manager	Internal Environmental Management, Eco-design, Environmental Outcomes
Company X	B	Operations Manager	Operational Efficiency, Cost and Competitive Outcomes
Company Y	C	Supply Chain / Procurement Manager	Supplier Collaboration, Reverse Logistics, Buyer Requirements
Company Y	D	Quality / Production Manager	Operational Improvements, Strategic Fit, Institutional Pressures

Table 6 Participant details

3.5 Data Collection Methods

To enhance the validity of the results via triangulation, a qualitative data collection method involving multiple sources was employed. This approach included secondary document analysis and semi-structured interviews.

3.5.1 Semi-Structured Interviews

Semi-structured interviews allowed respondents to share detailed perspectives while keeping discussions aligned with core themes. Each participant received a tailored interview guide.

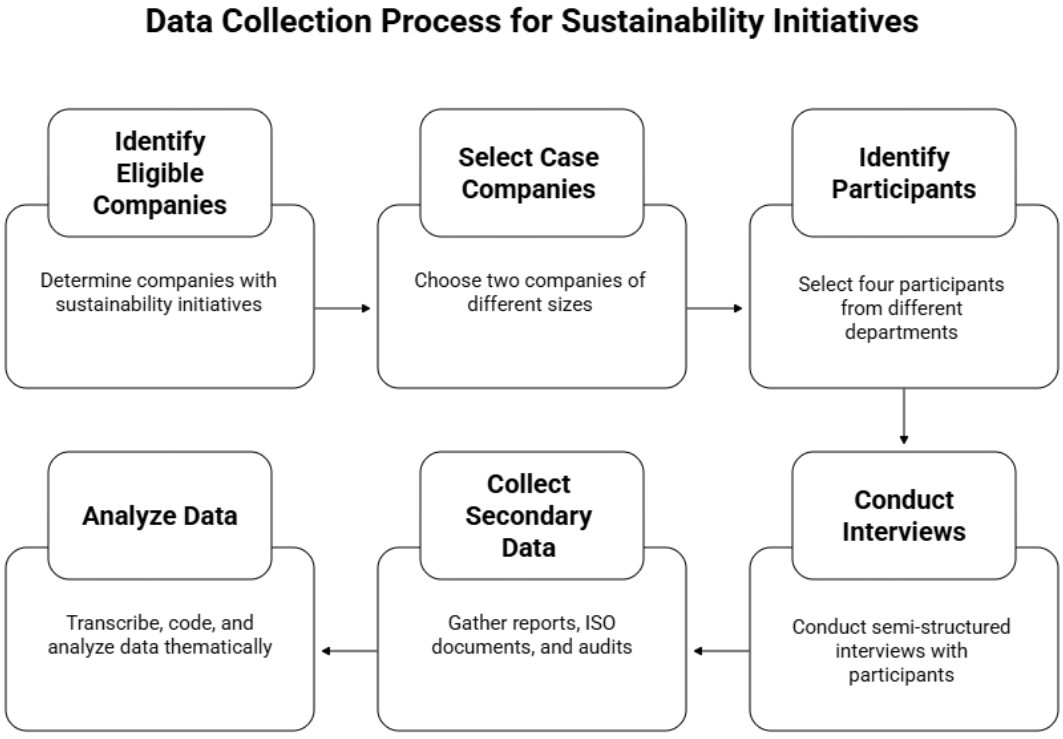


Figure 22 Overview of Data Collection Process (Author's own work)

3.5.2 Secondary Data

The use of such secondary documents as sustainability reports, ISO certifications, audit summaries, and BGMEA publications provided additional triangulation and depth to the overall context. These materials served to confirm and supplement the interview data.

3.5.3. Protocol & ethics

We provided research purpose, confidentiality, and right to pause/withdraw at any time and recorded verbal consent after each interview. Names of firms and persons are pseudonymized, sensitive commercial details generalized.

3.6 Data Analysis

The analysis of the data employed both cross-case comparison and theme analysis (Braun & Clarke, 2006). Familiarization and coding, development of themes, and comparison of patterns within and across cases all formed part of the process. To aid systematic coding and visualization, NVivo computer software was employed.

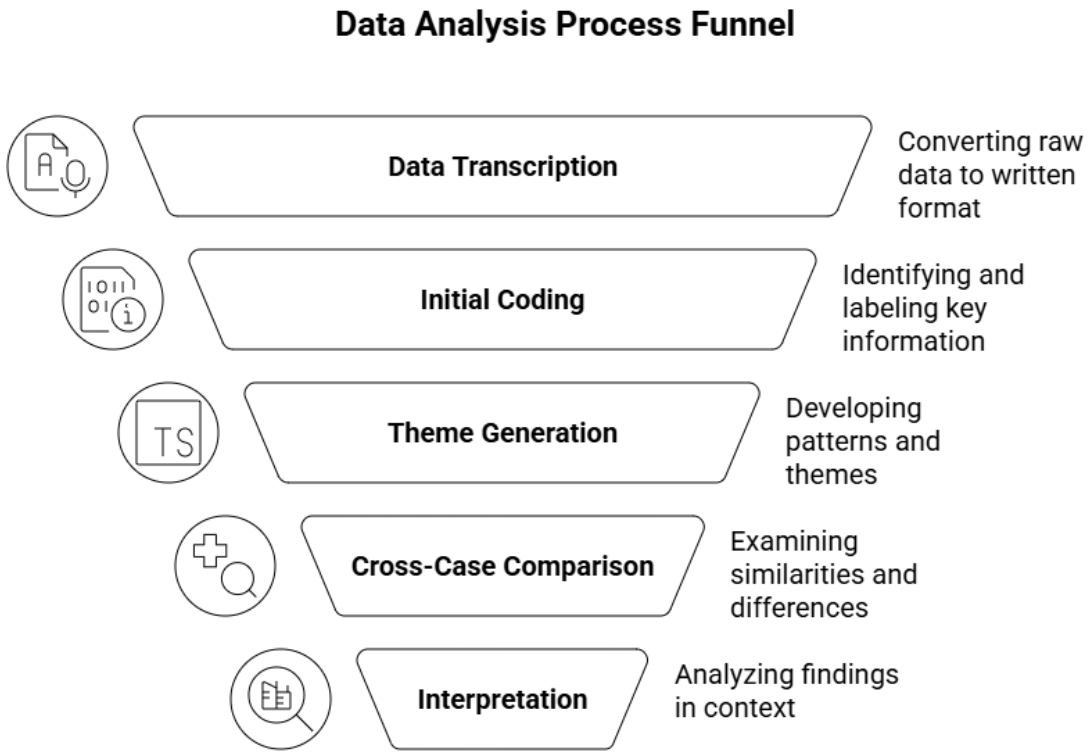


Figure 23 Thematic Analysis Procedure (Author's own work)

3.7 Trustworthiness and Rigor

Following Lincoln and Guba's (1985) framework, credibility, transferability, dependability, and confirmability were ensured. Credibility was achieved through triangulation and participant validation; transferability through contextual richness; dependability through a clear audit trail; and confirmability through reflexivity and transparent documentation.

3.8 Ethical Considerations

All research procedures followed the University of Vaasa ethical guidelines. Participants provided informed consent, and confidentiality was strictly maintained. Data were anonymized and securely stored, and all recordings will be deleted upon completion of the study.

3.9 Summary of Methodology

This chapter outlined the qualitative multiple-case study approach, data collection, and analysis procedures. By integrating interviews and secondary data, the study identifies the mechanisms through which environmental and operational performance mediate the relationship between GSCM practices and organizational performance.

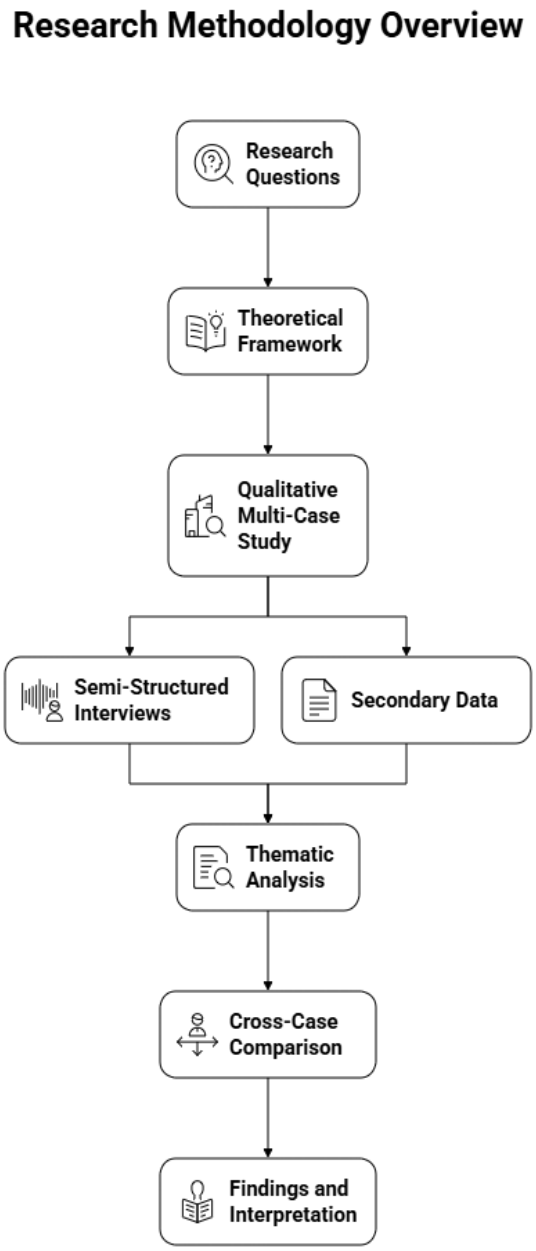


Figure 24 Overview of Research Methodology (Author's own work)

3.10 Required Software and Tools

Various data collection instruments and software were employed to effectively assist in the gathering, organization and analysis of the data. Throughout the dissertation, Mendeley Reference Manager was used to manage academic references and to keep the format for citations across context. All the literature sources including journal articles, reports and policy papers were systematically organized in Mendeley. This was performed for fast retrieval and correct documentation. Microsoft Word and Microsoft Excel were used for documentation, transcription, and data organization. Excel proved to be invaluable for the three tasks of sorting coded data, compiling matrices of themes, and making notes of key trends in the analysis that developed through interviews and secondary material. With the consent of the participants, their interviews were recorded using either a digital audio recorder or the audio recording application on a mobile phone, thus ensuring accuracy during transcription. To conduct the online interviews, we used Microsoft teams and Zoom Meeting, which also allowed us to schedule conversations with respondents in other regions. To obtain secondary data, the study made use of several academic and professional databases and resources. These were Tritonia Online Library, Google Scholar, ScienceDirect, ResearchGate and Europa.eu. These platforms provided access to research publications, case studies, and policy documents relevant to sustainable supply chain management, and the garments industry specifically in Bangladesh. Coupled with semi structured interviews, document analysis, and qualitative case studies, the use of these tools in this research was able to effectively capture an understanding of the mechanisms, and barriers to implementing Green Supply Chain Management in the Bangladeshi garments sector. The combination of these methods allowed the researcher to identify both the practical barriers, and the strategic opportunities for promoting sustainable behavior in industrial processes.

For ideation, organization of information, and text editing, this thesis employed Microsoft Copilot, and ChatGPT (OpenAI) as assistive artificial intelligence technologies. This was done using current educational practices and online research aids. AI assistance was most commonly used for:Initial ideation, such as brainstorming and the early stages of conceptual framing and mapping the literature. As we improve upon language and clarity, for instance rephrasing phrases to bring them into greater legibility while otherwise keeping the contents of the original text intact.

4. FINDINGS AND ANALYSIS

This chapter provides an analysis of the empirical data collected from four semi- structured interviews of managers at two garment production factories, Company X, and Company Y in Bangladesh. The goal of the chapter is to understand how practices of Green Supply Chain Management (GSCM) are applied in these organizations, what improvements in environmental and operational conditions these practices do bring, and under which circumstances those can translate in economic and/or reputational gains.

This analysis employs a qualitative, multiple-case study design which engages empirically with three strands of theory introduced in Chapter Two:

The Natural Resource-Based View (NRBV), that considers environmental management and eco-design as firm specific capabilities that may generate efficiency gains and competitive advantages; Institutional Theory, addressing the influence of coercive, mimetic, and normative pressures exerted by buyers, regulators and industry associations to pressure or support the adoption of green; and The diffusion and ecological modernization perspective, which reflects the dissemination of sustainability innovations within firms and over time, focusing on stages of maturity of capabilities and on contextual contingencies. Both of these frames provide a lens through which to view the evidence from two cases and explain how GSCM practices work in the Bangladeshi garment industry.

4.1. How to read this chapter

This chapter provides information about two apparel manufacturers — Company X and Company Y — which were called for. Each in-case analysis consists of iii tense context; iii instances of GSCM practices (internal environmental management, supplier/customer collaboration, eco-design, reverse logistics; iii) mechanisms chain from practice environmental/operational (EP/OP) improvements, economic/reputational implications; iv) circumstances that reinforced or weakened conversions (buyer pressure, strategy fit and digital/measurement enablement) . This chapter concludes with a cross case comparison and summary of findings.

4.2. Case Overview

The two case companies surveyed for the study—Company X and Company Y—are listed here - ownership, size, product range, certifications, key buyers and sustainability initiatives. Both work for export-oriented RGM which has been the subject of institutional pressure from global brands and regulatory agencies to employ environmentally-friendly production practices.

The two companies were selected by purposeful sampling to reflect the difference between ownership structure, buyers networks, and GSCM maturity to show how incompatible the existing capabilities may be, and what externally driven collaboration models are capable of.

Company	Ownership	Size / Employees	Product Range	Certifications	Key Buyers	Notable Green Practices
Company X	Local-owned	3,200	Knitwear (T-shirts, sportswear)	ISO 14001, LEED Platinum	H&M, Zara	EMS, eco-design, solar energy, wastewater recycling
Company Y	Joint venture (Bangladesh-Europe)	2,700	Woven garments (formal shirts, trousers)	ISO 14001, Oeko-Tex Standard 100	Marks & Spencer, C&A	Supplier collaboration, green purchasing, reverse logistics initiatives

Table 7 Overview of Case Companies ***Source: Interview data and company documents (2025)***

4.2.1. Company X

Company X is a small locally owned knitwear manufacturing company in the business for around 40 years, with about 3,200 workers and exporting mainly to Europe. It is exemplilty of late capability, it has achieved ISO 14001 and LEED Platinum. Spiber's approach toward sustainability also includes Internal Environmental Management (IEM), eco-design, and energy savings from solar and heat recovery systems. It has an Environmental Management System (EMS) that promotes cross-functional teams in setting targets, monitoring performance and compliance audits. The company draws on Life-Cycle Assessment (LCA) as a tool for material choices, uses recycled polyester and organic cotton, and has implemented water-savings in the dyeing processes.

Then, X's customers, among them H&M and Zara, conduct regular audits based on Higg FEM and ZDHC that exert both coercive and normative pressures. Over the years, this has evolved from actions based on compliance to those related to proactive sustainability innovation, meaning that the capability-building logic of NRBV applies. This is evident in its practice of environmental policies having been fully internalized, and responsible for corresponding measurable benefits in terms of environmental and operational performance.

4.2.2. Company Y

Company Y is a Bangladesh-European joint-venture that manufactures woven garments for European retail markets and has around 2,700 employees. Company Y's system for sustainability is more a networking, partnership model than that of Company X, which is an emphasis on internal systems. The main practices are those which focus on green purchasing, supplier collaboration, and reverse logistics. The firm mandates ISO 14001 or Oeko-Tex certification for Tier-1 suppliers, offers joint environmental audits, and operates fabric scrap recycling pilot programs.

Much of Company Y's green evolution is in fact the result of buyers such as Marks & Spencer and C&A, which implemented scorecard systems that track environmental performance, energy consumption, and waste. Thus, the Diffusion and Institutional Theory can explain NQD's strategy that resembles that of Incorporators, as it involves external pressures that force the firms to adopt sustainability, but the practices disseminate slowly throughout supplier networks and corporate partnerships .

Contractor Y is also less advanced in terms of capability maturity than Contractor X, but he reveals a good dynamic of inter-organizational learning as well as concrete environmental and reputational gains.

4.2.3. Case Selection Rationale

The two companies were selected to explore the opposite but complementary directions of GSCM development in Bangladesh's garment industry. Company X is an internal guided model of sustainability that combines capability building and digital monitoring systems to transform environmental strategies into operational and economic performance. Company Y illustrates a external policy, where compliance with the purchase requirements and supply-chain collaboration provides the opportunity to distribute green practices slowly.

Both cases were explored together enabling us to determine how institutional-diffusion pressures and capability-based mechanisms interact to influence performance at various organizational levels. Such contrasts establish an empirical basis for cross-case mechanism analysis later in Section 4.5.

4.3. Within-Case Analysis – Company X

4.3.1. Context and Overview

There are over 3,200 workers employed by Company X, a major knitwear exporter owned and operated locally. Company X distributes worldwide brands such as H&M, Zara and Next.

By 2018, the company received the ISO 14001 certification and LEED Platinum certification, and since then it has focused on environmental performance as a primary competency. A push from outside buyers inspired the company towards an environmentally-friendly business model, but then it quickly led to an internal incentive which came in itself from an Environmental Management System (EMS) and a sustainability team that directly reports directly to senior management. *In the beginning, we were merely testing to pass audits but today we are learning from our customers*, as the Environmental Manager (Participant A) explains. This transition from compliance to capability building is evidence of the growing NRBV type resource development, where environmental procedures are deliberately placed in the everyday activities.

4.3.2. Internal Environmental Management (IEM)

a) Implementation and Daily Routines

As part of IEM, Company X's integrated environmental management system has an integrated management system in place; their water, energy, and chemical performance indicators are tracked monthly by each department of Company X, which launched its integrated environmental management system.

The data of the environment is collected digitally through meters, and then uploaded to a central dashboard being monitored by the sustainability team.

Participant A tells participants, "*This means each month each of the sections receives its consumption report.*" One week later we hold a meeting to discuss the reasons for differences that we see.It is using this method to establish a continuous feedback loop between management and workers on the factory floor. For example, Green logbooks are used to record errors like leak repair, recalibrating dyeing machinery or retraining personnel. This helps ensure that all departments are held accountable and can learn from each other.

b) Audits and Continuous Improvement

H&M's Higg FEM assessors are trained to increase EMS through quarterly internal audits and two external verification each year through a double-fold in the year. The audits and verifications are done individually. The audit in 2019 found the dyeing unit was experiencing excessive effluent color levels. This was something to keep in mind because it was a remarkable example.

Participant A remembers this*"We found the pH controller was malfunctioning. Fixing it reduced chemical use by nearly 20 percent and improved color fastness."*

Some of these cases brought audits from being mere compliance checks to innovation-boosting accelerations. 2024 had been the year 2024 when it was recycling and its total water consumption per kilogram of fabric was cut by 30 percent, the previous year 2018, due to the elimination of a recycling rate of 60 percent.

b) Environmental–Operational Link

Cleaner procedures have, in fact, made a significant operational dividend. Overall, water quality prevented scale development of dyeing machines and boilers and provided about twenty percent less downtime by cutting the rate of scale production in dyeing machines and boilers. As the homogeneity of dyes declined, it dropped from six to three percent, and defects shifted from one to two percent.

Participant A noted, *"When we reduced water variation, the machines ran more smoothly and re-dyeing almost disappeared."*

Here the experience is seen as a prime example of the EP OP mechanism, which is the process in which environmental advantages directly increases process dependability. This type of synergy also contributed to internal motivation: operators began participating in informal contests for the "lowest-waste" line, an example of the shifting nature of environmental values within functions.

4.3.3. Eco-Design and Product Stewardship

The second pillar of environmental capacity for Company X is eco-design.

The designers are currently performing the Life Cycle Assessment (LCA for major product categories) and the results will be applied to material selection and packaging selection.

One of the participants, A, provided an example, *"In 2022 we redesigned a women's T-shirt line using recycled polyester and digital printing. It reduced dye use by 25 percent and production time by two hours."*

Other efforts included the deployment of biodegradable poly-bags to satisfy a buyer's request for proof of plastic reduction. A six month trial with a local supplier led to the project costing around 1.2 tons of virgin plastic per year and has resulted in savings of nearly six months of testing and collaboration with a local supplier. This activity also benefits the environment and market: reduced input costs, faster production, and better brand impression among consumers. CAD-based cut patterns have reduced fabric waste by eight percent, equivalent to about seventy tons per year. Eco-design also improved communication between manufacturing and marketing divisions of the company.

One participant, A, stated that *"When our designers show buyers LCA data, they see our capability, not just price."*

While environmental data became an environmental value, this exposure led to a reputational value, example of how environmental transparency helps products and services differentiate themselves in the market.

4.3.4. Operational Alignment and Digital Enablement

Managing officer Participant B provided a description of digitalization‘s ability to integrate sustainability data with current production control.

"This dashboard also includes quality indicators, and each line supervisor has access to the amount of steam and electricity used as well," he said. This real-time insight can be used to take action speedily when consumption above the limits is higher.

1) Integration of Lean and Green Practices

Over the course of the years 2020 to 2024, the organization improved its infrastructure:

- Low-liquor-ratio dyeing machines were able to conserve twenty-five percent of the water that was used for each batch.
- Condensate-recovery lines recycle boiler steam, which results in a reduction in the cost of gas.
- LED task lights reduce the power used by fifteen percent.
- By reworking the layout, the material movement decreased by 15% and the changes in the layout resulted in a cut in the amount of movement.
- Two of the benefits of automated chemical dosing were reducing operator error and improving worker safety.

One participant, B, explained that even small changes made for the method would result in double-sided effects: *“When we replaced manual valves with digital meters, we saved energy and avoided overtime because there were fewer breakdowns.”*

2) The Results of the Performance

Several advantages were gained as a result of these operational enhancements: The

- productivity increased by ten percent.
- utilities cost 15%.
- A monthly reduction of approximately USD 20,000 in steam recovery.
- 40 percent reduction in rework.
- The lead time was reduced by six percent.

Acquiring cash for reinvestment in new machines, the operational benefits assisted to maintain environmental objectives.

Participant B explained, *"the savings from one boiler upgrade paid for the solar-panel extension."*

These types of reinvestment loops show the capability of NRBV to sustain environmental development by making gains through efficiency, a self-repairing mechanism of NRBV.

c) Interaction with Humans

Another interesting development was the workers participating. Environmental measures were a concern for operators at the beginning, when operators considered environmental actions to be more significant. The management did so by conducting monthly "Green Circle" meetings where staff offered ideas for their participation that could be applied in practice. A leader of the sewing line proposed using automatic machine shut-offs while he was busy, in which the entire plant used it. "*When workers see their ideas saving power, they feel proud; that pride keeps the program alive*," Participant B said. "*This realization keeps the program alive.*" The institutional institutional internalization of environmental values also replicates the cultural insertion of environmental values in the incorporation of external rules as part of the identity of a corporation.

Practice	Intermediate Mechanism	Outcome (EP/OP/ECON/REP)	Illustrative Evidence
ISO 14001 EMS + audits	Feedback and learning loops	EP ↓ water 30 %, ↓ chemicals 25 %; OP ↓ downtime 20 %	*"Deviations trigger a meeting within a week."*
Eco-design & LCA	Material substitution & innovation	EP ↓ waste 8 %; OP cycle time ↓ 2 h per batch	*"Recycled polyester reduced dye use 25 %."*
Digital dashboards	Real-time control & accountability	OP ↑ productivity 10 %; ECON utility ↓ 12 %	*"Supervisors see data beside quality metrics."*
Worker engagement	Motivation & ownership	REP ↑ buyer trust; internal culture ↑	*"They feel proud when ideas save power."*

Table 8 Mechanism Summary – Company X

4.3.5. Enablers and Constraints

Important Facilitators

1. Support for sustainability from top management: Board meetings are held quarterly to review KPIs. 2. By customers' coalitions where brands co-finance pilot projects for example H&M sponsored the water meters installation. 3. ERP can be integrated with digital infrastructure to ensure precise data. 4. Programs to empower and value employees are

connected to social/green innovation of relevance. re-investment of finances: savings pay for additional upgrades.

Important Restrictions

1)Capital intensity: advanced dying technology requires expensive upfront capital investment . 2) Department Readiness: Lack of expertise in chemical compliance, especially for small local suppliers. 3) Training Turnover – Again, due to labor mobility, continuous orientation is necessary. Regulatory lag: process lag in authorizing renewables.

Participant A summarized: *"The biggest risk is losing momentum when costs rise or people change; sustainability must be institutional, not personal."*

4.3.6. Mechanisms and Process Narrative

The findings reveal a coherent GSCM → EP → OP → ECON/REP chain

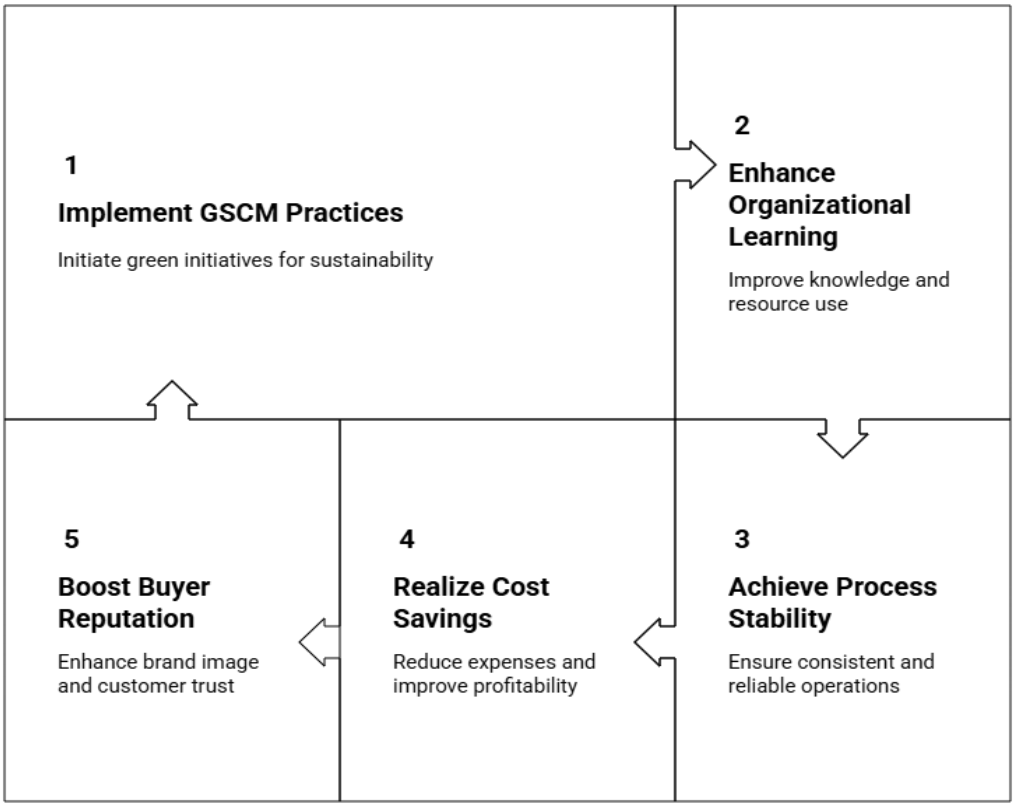


Figure 25 Mechanism Flow – Company X (Author's own work)

Narrative Explanation

- The measuring and learning procedures are formalized by the EMS.

- Instantaneous corrective feedback is prompted by the availability of data (learning process).
- Process regularization is aided by cleaner inputs (resource-efficiency mechanism).
- Reputation and trust are established by operational consistency, reduced costs, and risk expenditures (reputational mechanism).
- Reinvesting savings sustains dynamic potential.

The validity of the evidence is strengthened by the use of KPIs and several sources of evidence from Participants A and B.

4.3.7. Interpretation through Theoretical Lenses

Natural Resource Based View (NRBV). Company X illustrates that environmental management can be a strategic capability. Its EMS, eco-design, and digital systems provide valuable and irreplaceable resources that continue to innovate and produce. The combination of learning loops and reinvestment, in turn, demonstrates an dynamic ability that becomes sustainable competitive advantage with the return of environmental improvement.

Institutional theory. External buyer audits first appeared to be a coercive, but eventually became normative expectations shared by the firm.

Companies X also transformed compliance into legitimacy and reputation through international reporting mechanisms.

As a result, institutional pressure was a trigger. While internal capacity was maintained.

Diffusion / Ecological Modernization. As one of the pioneering RMG manufacturers in Bangladesh, Company X is now influential among peers through BGMEA forums and supplier workshops. These practices diffuse outward, representing ecological modernization which works resembling industrial efficiency, where environmental improvements correspond to industrial efficiency.

4.3.8. Mini-Summary of Company X

Mechanism Chain	Evidence	Outcome Type
IEM → EP	ISO 14001 EMS; water ↓ 30 %; chemicals ↓ 25 %	Environmental
EP → OP	Cleaner inputs; defects ↓ 40 %; downtime ↓ 20 %	Operational
OP → ECON/REP	Utility ↓ 12 %; preferred supplier status	Economic & Reputational
Contextual Moderators	Buyer audits; digital dashboards; worker culture	Strengthen all pathways

Table 9 Summary of Company X

Summary Narrative: Company X's example demonstrates this transformation and the development of internal abilities for GSCM to shift from a mere compliance initiative to a put in place strategy. Operational and environmental upgrades were identified as synergistic, and cross-functional learning and eco-design created a feedback loop. The story of Interface is the heart of the NRBV's argument, *green capabilities are not costs—they are engines of competitiveness.*

4.4. Within-Case Analysis – Company Y

4.4.1. Context and Overview

Company Y is an independent Bangladeshi joint venture manufacturer that employs around 2700 people in Europe. It produces woven shirts and pants for European buyers like Marks and Spencer or C&A. While Company X has good internal systems and solid processes, Company Y utilizes network sustainability as a function of collaboration between sellers and product producers, product development and circularity. It has ISO14001 and Oeko-Tex Standard 100 certifications but is continuing to improve upstream and downstream coordination in order to get the most rigorous environmental scorecards.

"*Our buyers are always demanding from us to show them numbers—carbon, water, packaging.*"said the Procurement Manager (Participant C). "*We needed to change how we worked with suppliers"*. The influence of institutional pressure and diffusion is displayed as a function of Company Y's GSCM maturity trajectory based on institutional pressure and diffusion.

4.4.2. Green Purchasing and Supplier Collaboration

Embedded Environmental Criteria Since 2020 Company Y has demanded its raw-material suppliers to have certification on ISO 14001 or Oeko-Tex in order to renew contracts. The customized procurement system rates suppliers on environmental performance along with cost and quality . "*Everything was as per the previous price,"* Participant C. *"Now, for example if there's no record of a supplier handing over wastewater data we mark them low, even if they are cheap*. " These pressures are buyer-driven coercive, and industry standard normative pressures. Instead, the company conducts two annual co-audits that are centered on water management, chemical safety, and solid-waste control. For example, the fabric Company Y had been sourcing for many years was found to have not passed two auditing processes and the factory owner was forbidden further shipments of their material until the

environment was improved, a clear indicator that keeping up with environmental compliance has become part of doing business.

Co- improvement and learning Not only for punitive, but is not exclusively the collaborative model. In 2022 Company Y and three key suppliers did a training on chemical substitution at the PaCT program of BGMEA . "*We learned to switch to ZDHC approved dyes*," Participant C said. One supplier was able to convert their dyeing into a low-COD process, which saved 18% of the effluent load. Company Y provided support by introducing lab access and funding to run the test. Another is eco-package: a card box manufacturer started using recycled paper after Company Y delivered to their customer the specifications sheet. Both in terms of the packaging waste and in the packaging size improvements there was a minimum of increase 30%. "The change made our buyer happy and we did one more order", the manager said. These examples illustrate how the adaptation mechanism of inter-organizational learning is able to create a collective competence within the supply chain.

4.4.3. Reverse Logistics and Circular Practices

Company Y is early but improving in reverse logistics. Participant C explained that "we collect fabric scraps from production and send them to a local recycler who puts them into yarn for lower-grade textiles." The recycling industry uses 25% of the cutting-floor waste each month. The program began in 2021 when a buyer asked him for a proof that waste-minimization practices were being followed.

Other than pallets and poly bags, the company uses wooden pallets and poly bags for outbound shipment in conjunction with logistics partners. A 2023 pilot with a European retailer introduced a take-back mechanism for offcuts from sampling during the period. In response to the experiences of the participant, Participant D said, "*We shipped back 300 kilos of scraps; the buyer used them for home-textile fillers. It was small, but it showed what could be.*"

These programs represent the eco-modernization logic of circular loops created by buyer and seller collaboration instead of regulation.

4.4.4. Operational and Quality Improvements

According to the Producer Manager (Participant D) the benefits of environmentally sound production were in regards to stability in the operations. "*We're hardly re-do re- dyeing now because there is less but, cleaner chemicals mean less shades; cleaner chemicals make us greener*". The use of ZDHC certified dyes as well as automatic chemical dosing pumps has

contributed to reducing defects from 7% to 3% and reduced the dilution time/ dyeing line downtime by 20%.

Compressor maintenance repair costs decreased by 14% after audits of their energy management. The company also suggested predictable maintenance schedules with such features as notifications to energy use when exchange filters are replaced, but not at set times. Participant D states, *"Before, we maintained machines when they broke; now data tells us when to act."*

This sort of operation that leverages digital data as a tool is a new way of operating that Company X could realize from access to the digital world at a more advanced stage.

4.4.5. Buyer and Institutional Pressures

There are institutional forces at play. The "Higg Index FEM Scorecard" used by Marks & Spencer, evaluates energy, water and chemical management of the suppliers. "*If we lose below 70 points they freeze new orders until we recover*" – C. This external discipline opens the way for internal shifts. At the bottom of 2021 Company Y had established a monthly meeting to form the sustainability task force. The recycling pilot also received technical advice by the same purchaser, and they also covered 20% of the costs of trainings, reinforcing how the coercive and the collaborative are intertwined.

This is government control. The web based data submission for renewal of environmental clearance certificate is being used today. "*We can no longer put the ETP reports and the system locks you out*," Participant C. stated. The growth of digital government comes at the expense of the industry, and that of digital governance at the expense of the industry.

4.4.6. Enablers and Constraints

Enablers

- Buyer relations: steady technical and financial support from major buyers.
- Joint-venture ownership: access to European managerial skills and technology norms
- BGMEA and PaCT programs: external training and technology transfer avenues.
- Employee adaptability: Attitude of young engineers to the adoption of digital tools.

Constraints

- Heterogeneity of supplier: small firms, lack of capacity to be certified.
- Cost pressure – raw material prices rise 5-10% – cleaner inputs are more costly.
- Infrastructure constraints: not all demographics of scrap can be managed by local recyclers.

- Data complexity: reporting required by various systems (buyer portals, govt. BGMEA) is cumbersome.

Participant D said, "*We spend more time filling forms than improving processes but this will change as systems merge*."

4.4.7. Mechanism Summary – Company Y

Practice	Intermediate Mechanism	Outcome (EP/OP/ECON/REP)	Illustrative Evidence
Green purchasing & audits	Supplier evaluation & knowledge transfer	EP ↓ chemical use 18 %; OP ↑ delivery reliability	"Joint audit fixed dye process—COD down 18 %."
Joint training (PaCT)	Inter-firm learning	EP ↑ compliance; REP ↑ buyer trust	"We learned together to use ZDHC dyes."
Reverse logistics	Material recovery loops	EP ↓ landfill 25 %; ECON minor scrap value gain	"Sent scraps to recycler—yarn made again."
Energy management audit	Preventive maintenance routine	OP ↑ efficiency 14 %; ECON cost ↓	"Data tells us when to maintain machines."
Buyer pressure (Higg FEM)	Compliance and resource allocation	REP ↑ preferred supplier status	"Below 70 points means no orders."

Table 10 Mechanism Summary – Company Y

4.4.8. Mechanism and Process Narrative

This is an owner driven diffusion path and Company Y's experience reveals the same. External audits reveal problems of performance; joint programs transfer new knowledge and technology; internal processes adapt to a new framework of environment; performance translates more efficiency, compliance and reputation .

Causal Sequence

- Purchaser pressures Evaluation of suppliers Pressure Mechanism.
- Cross-learning Strengthened capacity (learning tool)
- Lower defects and energy use; quality; resource misallocation mechanism.
- Verified performance Preference status (reputational mechanism).
- Recycling pilot symbol of eco-innovation (diffusion mechanism).

These processes are partially mediated as environmental and operational changes both lead and are driven by economic changes. The financial aspects are still very marginal as many of the 'outcomes' such as greater reputation, and maintaining order are indirect benefits.

4.4.9. Interpretation through Theoretical Lenses

Natural Resource Base View (NRBV) . In these years environmental management has become a core ability of Company Y. In line with the idea projected by NRBV of capabilities derived from ongoing problem- solving, we can also view the PaCT trainings and the digital audits as a beginning of learning and productivity gains.

Institutional Theory Context. Adoption is driven by global buyer's pressures. In addition to their compliance requirements with audits, scorecards and certifications, industry associations not only serve as a trigger but bring normative pressure for long term change. Institutional compliance has thus been able to act as a legitimization for the continuation of the market continuity.

Diffusion and ecological modernization. In this regard the trajectory for Company Y is also similar to the diffusion curve of innovation, starting as an exogenous imposition, and eventually becoming an endogenous process that suppliers begin to replicate. The recycling program is a case of ecological modernization, a form of environmental management that uses operational improvements.

4.4.10. Mini-Summary of Company Y

Mechanism Chain	Empirical Evidence	Outcome Type
Green purchasing → EP	Supplier audits; COD ↓ 18 %; packaging ↓ 30 %	Environmental
EP → OP	Cleaner chemicals → defects ↓ 4 % ; downtime ↓ 20 %	Operational
OP → ECON/REP	Energy cost ↓ 14 %; preferred status retained	Economic & Reputational
Contextual Moderators	Buyer pressure; joint venture ownership; training platforms	Strengthen linkages

Table 11 Mini-Summary of Company Y

Summary Narrative Company Y shows that institutional alignment alone cannot avoid the risk that internal capacity will obfuscate the early stages of GSCM development. Through efforts to audit this by the buyers, train the supplier, and initiative such as circular economy for environmental and operational purposes and has enhanced its "green"/forward thinking manufacturing reputation. This diffusion- through- partnership model of implementing is essentially just that, in practice. network actors pooled capabilities and the competition was based on collaboration and adherence to international sustainability standards, not just individual efficiency.

4.5. Cross-Case Thematic Analysis and Mechanism Mapping

4.5.1. Overview of Emerging Themes

Thus, Firm X and Company Y represent two distinct but related pathways to Green Supply Chain Management in the Bangladeshi garment industries. Company X is a capability driven model, as it sees sustainability absorbed within environmental management systems, eco-design, and digital surveillance. Firm Y is motivated by institutional pressure, collaborative and diffusion, a form of consumer-driven institutionalization that mainstreams green practices into the mainstream.

Across both firms, five interrelated themes emerged:

Theme	Company X (Capability-Driven)	Company Y (Buyer-Driven)	Interpretation
1. Internal Environmental Management (IEM)	ISO 14001 EMS; real-time dashboards; continuous improvement	ISO 14001 compliance; task-force oversight	X: capability integration; Y: compliance-led learning
2. Eco-Design and Resource Efficiency	CAD waste reduction, recycled fibers	Packaging redesign, cleaner chemical substitution	Both achieve EP → OP gains through material innovation
3. Supplier and Customer Collaboration	Limited but data transparency with buyers	Intensive supplier audits, joint training, reverse logistics	Institutional pressure shapes inter-firm learning
4. Digital Enablement	ERP dashboards for energy and water	Buyer-linked digital scorecards, PaCT platform	Digitalization accelerates diffusion and monitoring
5. Strategic and Cultural Fit	Sustainability embedded in business model	Sustainability tied to buyer reputation and compliance	Context defines capability maturity and motivation

Table 12 Interrelated themes emerged

4.5.2. Comparative Analysis of Mechanisms

The two companies have the same core mediation chain, GSCM Environmental (EP) Operational (OP) Economic/Reputational (ECON/REP) but strength and the source of mechanisms varies.

Mechanism	Company X (Internal Capability)	Company Y (Institutional Diffusion)	Outcome

Learning and Feedback Loops	EMS audits, dashboards, corrective actions	Buyer audits, training feedback	Environmental efficiency, reduced waste
Resource Efficiency	Cleaner production, energy recovery	Energy audits, cleaner inputs	Improved process stability, cost savings
Organizational Integration	Cross-functional teams, reward systems	Sustainability task-force, top-down control	Institutionalization of routines
Collaboration and Trust	Buyer partnerships on transparency	Supplier–buyer joint improvement projects	Enhanced compliance and reputation
Digitalization	Internal ERP + sensors	Buyer scorecards, external platforms	Data reliability, audit readiness
Reinvestment and Innovation	Cost savings reinvested in green tech	Buyer-supported pilots and recycling	Capability growth and innovation diffusion

Table 13 Comparative Mechanisms and Pathways

Interpretation:

- In the case of Company X, there is greater mediation in that environmental improvements will impact on operations and economic performance directly.
- In Company Y the value of operations and reputations is partially controlled by external support and network maturity. This suggests a dual path model with internal or external motivation for adaptation.

4.5.3. Mechanism Flow Diagram

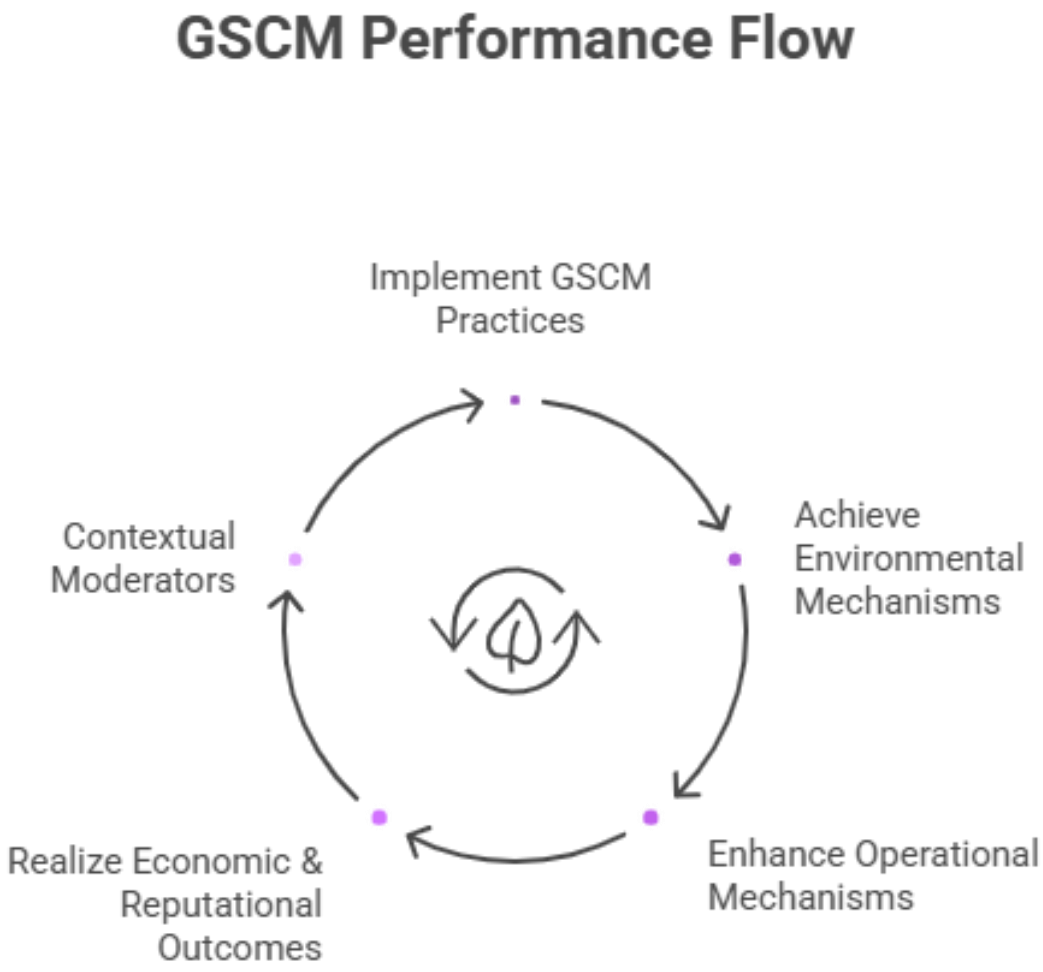


Figure 26 Mechanism Mapping of GSCM → Performance Pathways (Author's own work)

Narrative Explanation: The diagram demonstrates that environmental performance leads to operational stability by, among other factors, reducing variability in resource use, waste, and rework . Such operational advantage transits as economic (cost and efficiency) and reputational benefits (being favored, buyer confidence). Such relationships are contingent on moderators such as digital competence, strategic fit, and buyer support.

4.5.4. Thematic Discussion: What Differs and Why

(a) Environmental → Operational (EP→OP) Mechanism

While in the two companies this translation from the environmental to the operational is very clear, the reasons for this clarity are distinct. Such as; control of process and investment in

technology like Company X or training of buyers and supplier development programs like Company Y. Silver-coated cleaner input had a positive influence in X, while supplier adherence to the specification given by the firm in the instruction manual regarding the way that materials needed to be transported to the site had a negative influence in Y. This further supports the NRBV contention that the influence of capability maturity on the EP→OP argument is being strengthened.

(b) Operational → Economic/Reputational (OP→ECON/REP) Mechanism

The economic impact was more immediate with company X, as enhanced operational efficiency led to better cost position and increased competitiveness. For company Y their benefits were generally only of reputation, to continue being a favorite supplier and continue to be ordered from. Such a discrepancy shows perhaps that if capacity seems to be compensable by institutional credibility in the early phases of the diffusion process, not all benefits can be achieved from such a compensatory arrangement in the form of cash.

(c) Contextual Moderators

Geographical Pressure: In both cases central but less determinant for Company Y.

Strategic Fit: Both companies meet sustainability with cost leadership, while Company Y is better positioned given consumer brand acceptance.

Access to the Online World: X's digital dashboards provide a way for autonomy; Y's consumer- oriented platforms are imposing accountability . So, capabilities and conditions interact to condition levels of mediation.

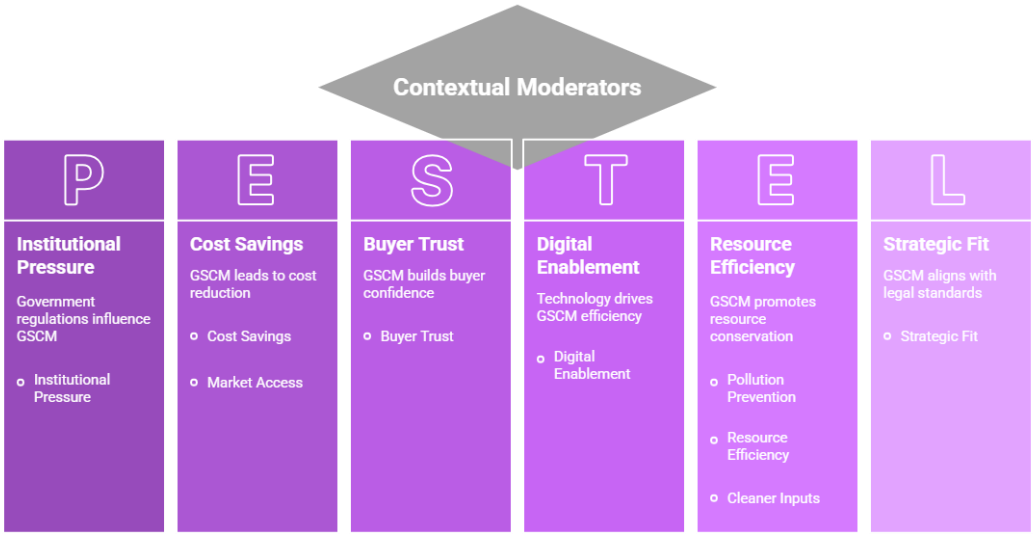


Figure 27 Contextual Moderators Flow (Author's own work)

4.5.5. Boundary Conditions and Variability

Analysis reveals that mediation is contingent, not universal:

Condition	When Mediation Strengthens	When It Weakens
Regulatory & Buyer Pressure	Clear standards, consistent audits	Fragmented buyer requirements
Time Horizon	Medium-to-long term (investment payback)	Short-term cost pressures
Reverse Logistics Infrastructure	Established recyclers, local ecosystem	Lack of circular network
Strategic Alignment	Environmental goals tied to business KPIs	Treated as separate CSR domain
Digital Maturity	Real-time data and visibility	Manual, fragmented reporting

Table 14 Boundary Conditions and Variability

4.5.6. Summary of Cross-Case Insights

Dimension	Company X (Capability-Based)	Company Y (Institutional Diffusion)	Common Finding
Core Driver	Internal learning & reinvestment	Buyer audits & collaboration	GSCM enhances legitimacy & efficiency
Mediation Strength	Strong & direct	Partial & indirect	Environmental → Operational link consistent
Economic Payoff	Immediate through cost savings	Delayed, mostly reputational	Both gain buyer stability
Capability Maturity	Advanced (early adopter)	Developing (fast follower)	Diffusion in progress
Contribution to Sector	Demonstrates local innovation	Demonstrates compliance diffusion	Together show Bangladesh's green evolution

Table 15 Summary of Cross-Case Insights

4.6. Summary of Findings

4.6.1. Revisiting the Research Questions.

RQ1: *How do Bangladeshi garment manufacturers implement key GSCM practices, and what mechanisms link these practices to environmental and operational improvements?*

RQ2: *Under what contextual conditions do these mechanisms translate into economic or reputational outcomes—and when are they strengthened or weakened?*

The findings imply that the process through which companies' adopt GSCM practices may move in two different directions: progressing internally into the development of corporate capabilities and external diffusion . Second, performance outcomes are contingent on performance changes in environmental and operational performance, and the mediating effect is contingent on finding an adequate statistical model fit the firm level of analysis.

4.6.2. Core Findings

- Among the highlights of company green supply chain behavior identified were the following four core practices: Internal Environmental Management, Eco-Design, Supplier Collaboration, and Reverse Logistics.
- Mechanistic Pathways: There are identifiable mechanistic pathways that each practice utilizes in order to achieve certain performance outcomes: i.e., organizational learning, efficient use of resources, stabilization of processes, inter-firm cooperation .
- Environmental → Operational Mediation : Elimination of toxic inputs and reduction of waste directly enhance production stability, quality of the product, and efficiency in energy; Of these, this is the most robust and consistent across both cases.
- Operational → Economic/Reputational Mediation: cost cutting efficiency and buyer assurance. Company X's main benefit is direct cost reduction, while Company Y benefits because it not. only secures legitimacy but also long-term continuity of a buyer.
- Role of Contextual moderators: Institutional pressure, strategic fit, and digital enablement increase the mediation effect. But, they have relatively weak infrastructures, an immature set of suppliers, and dispersed regulation.
- Evidence of Diffusion: X & Y as forerunners in the development of a GSCM ecosystem in Bangladesh; X serving as pioneer of internal capacity diffusion; Y as gateway to learning for suppliers in their upstream tiers.

4.6.3. Mechanism Summary Table

Practice	Mechanism	Intermediate Outcome (EP/OP)	Final Outcome (ECON/REP)	Moderator
Internal Environmental Management	Learning loops, feedback control	↓ water & chemical use	↓ cost, ↑ buyer credibility	Digital dashboards
Eco-Design	Material efficiency & LCA innovation	↓ waste, ↑ throughput	↑ product reputation	Strategic alignment
Supplier Collaboration	Joint audits, training	↑ compliance & reliability	↑ reputation, repeat orders	Buyer pressure
Reverse Logistics	Recovery network pilot	↓ waste, ↑ recycling rate	Small economic gain, symbolic legitimacy	Infrastructure readiness
Digital Integration	Transparency, traceability	↑ speed of decision & accuracy	↑ trust, audit pass rate	Capability maturity

Table 16 Mechanism Summary

4.6.4. Theoretical Contributions

- NRBV Confirmation: . The sustainability of internal environmental management and eco-design capabilities establishes NRBV's capability logic because 'both capabilities lead to efficiency and cost saving benefits and are valuable and inimitable'.
- Buyer/risk and regulatory pressures as coercive and enabling pressures: Expanding on institutional theory. Over time, this kind of compliance leads to behavioral/normative compliance in which adherence to sustainability norms are incorporated into routinized practice.
- This finding also supports the diffusion variable and is interpreted in line to the ecological modernization hypothesis that environmental and economic goals are more likely to be related . Green practices are transmitted horizontally across tiers in Company Y's network of suppliers.

4.6.5. Sectoral Implications

- The link between GSCM and performance is not direct and linear, but represents a process. It is the resources of the firm and the nature of the buyer that dictate the time the process takes place.
- The purpose of this is that with the rise of digital, compliance, and capacity can move very quickly, and this leaves a critical policy space for the state, as well as the BGMEA.
- These are collaborative and training ecosystems, and also key to replicate the diffusion beyond suppliers at Tier-1.
- The advantages of green investments accrue when they become integrated into a company's strategy, rather than being thought of as separate CSR measure.
- The RMG sector in Bangladesh, which is notoriously fickle, "…is currently transitioning from a sustainability of compliance, to a sustainability of innovation" .

4.6.6. Concluding Reflection

Combined, these two cases offer insight into what the transition process to a focus on capability-based sustainability looks like for garment firms in Bangladesh. Company X is an example of proactive innovation and Company Y provides a model of adaptive compliance moving towards partnership based modernization. Beginning from different reference points, they ultimately confirm the central argument of this dissertation.

The latter can only be achieved by incorporating environmentally friendly supply-chain practices making those part of operational logic, and being sustained by a level of trust in institutions.

Limitations and Future Research Directions

Limitation	**Implication**	**Future Research Suggestion**
Two-company sample	Limited generalizability	Extend to mid-tier suppliers & brands
Self-reported data	Potential bias	Triangulate with audit documents
Focus on environmental dimension	Social sustainability omitted	Include social and labor aspects
Cross-sectional timing	No longitudinal tracking	Explore performance evolution over time

Buyer perspective absent	One-sided view	Add buyer interviews for dyadic insights

Table 17 Limitations and Future Research Directions

5. DISCUSSION AND IMPLICATIONS

Chapter 5 presents interpretations of the results that were gathered and presented in chapter 4 with respect to the established theoretical framework, the research questions, and the existing literature on Green Supply Chain Management (GSCM) and sustainable performance . The goal should be to generalize the findings of the two case companies, Company X and Company Y into more general; theoretical and managerial learning.

The latter is organized around the central purpose of the study – examining how and why Bangladeshi garment manufacturers adopt central GSCM practices, and how, through what mechanisms, these practices result in environmental, operational, and financial performance outcomes given specific contextual constraints and conditions.

These reveals that in fact both companies are actively participating in environmental initiatives, though in very different ways. Company X can be included in the latter model because it shares the characteristic of systems and standards accounting for leading environmental-operational-economic relationships through their enacted processes (ISO 14001 EMS, eco-design, digital monitoring) . Company Y is instead a demand-driven case, where the adoption of GSCM is predominately triggered by the existence of external institutional pressures, common audits, and shared training. But, both cases exhibit performance in terms of direct environmental and operational benefits, which lends support to Green et al.'s (2012) mediation argument and Zhu et al. (2012) – indicating that GSCM practices exert an indirect positive impact on economic performance via intermediate improvements in environmental and operational performance.

This analysis is advanced in six parts. Noting the trends uncovered by the study, the conclusions of the analysis in section 5.1 attempt to make sense of the research findings by applying the lenses of the Natural Resource-Based View (NRBV), Institutional Theory and Diffusion / Ecological Modernization perspectives. Theoretical contributions are summarized in section 5.2 and managerial and policy implications are discussed in section 5.3. Sections 5.4- 5.5 present limitations of the study and future research, and Section 5.6 concludes the chapter.

5.1. Theoretical Discussion

The results of this study also contribute to extending existing literature on GSCM and the relationship between green activities and performance as it demonstrates the how green practices lead to certain outcomes at the organizational level, and under what contextual factors. Also, each of the three theories that guide this means of analysis, NRBV, Institutional

Theory, and Diffusion/Ecological Modernization, helps to illuminate different dimensions of this relationship. Both these theories provide a nuanced discourse on the GSCM-performance link in the context of the Bangladeshi garment sector.

5.1.1. Natural Resource-Based View (NRBV): GSCM as Capability Development

NRBV Posit that companies actually attain competitive advantage through the creation of distinct capabilities allowing for pollution prevention, product stewardship, and sustainable innovation (Hart, 1995; Teece, Pisano & Shuen, 1997). As analyzed in this research, Company X is one pertinent example.

In the case of X, the company's aforementioned EMS, eco-design capabilities, and the utilization of informational monitoring capacities are abilities that contribute to increased efficiency and enhanced market legitimacy as they are valuable, rare, and inimitable. On one hand, EMS functions as a learning process that becomes an institutionalized routine in environmental practices and corrective measures, and on the other the eco-design allows innovation of materials and processes. This is in line with the results of Green et al. (2012) and Golicic & Smith (2013) that consider internal environmental management and eco-design capabilities as the basis of operational and financial improvements.

For example, Company X was able to see a 30% Water reduction, a 25% lower CRR and 12% ELC by investing in a low-liquor-ratio dyeing machine, condensate recovery system, or real-time dashboard, which are the very types of capability to prevent pollution suggested here by NRBV. While reinvesting cost savings into new environmental technologies indicates the presence of dynamic capabilities because this reflects a process of ongoing innovation, and thus the constant renewal of resource efficiency (Teece, 2007).

These capabilities were important because they didn't just minimize the need for labor intensive inputs in themselves, but they stabilized production, minimized the need for re-work, and improved the quality of products. It is the coupling of the environmental and the operational that captures what Rao and Holt (2005) referred to as the greening of the production process, linking environmental improvements to increased environmental performance in operations. As a result, Company X has moved from a state of compliance to one of proactive fire planning, which is in and of itself in line with the NRBV argument that "environmental management becomes a strategic resource...only once it is seamlessly integrated into the fabric of the organization and its routines" (Hart and Dowell, 2011, p.620).

The Company Y, on the other hand, reveals capability formation in an earlier phase. It has, for instance, adhered to ISO 14001 and adopted green purchasing practices, but arguably

more in response to buyer requirements than as part of an internally-generated strategic plan. But its involvement in the BGMEA's Partnership for Cleaner Textile (PaCT) program, the co-funded audits, and training for suppliers is a form of early capability building, a stage in which companies are able to exploit external knowledge to develop internal learning routines (Bowen, Cousins & Lamming, 2001). If the learning and technology reinforcement process is continuous for firms then eventually, the externally supported projects could become internalized capabilities.

The NRBV, therefore, helps in understanding the variability in the outcomes of GSCM observed at firm level . The company X presents full mediation (environmental → operational → economic) and company Y partial mediation with limited internal capability maturity. These findings add value to Laari et al.'s (2018) claim that GSCM-performance relationships are influenced by the alignment of capabilities for sustain ability and competitive strategy.

5.1.2. Institutional Theory: Buyer and Regulatory Pressures as Drivers of Adoption

Institutional Theory also offers a more detailed explanation of which external pressures influence organizational behavior (DiMaggio and Powell 2000; Scott 2001). All of this serves to corroborate the findings of this study in what three main forces are concerned; coercive, mimetic and normative.

The kind of buyers like H&M, Mark&Spencer, C&A, that put environmental standards on the table for their suppliers are for sure buyers that pressure monopolistic suppliers to do something for themselves. For example, Company Y has their order continuity dependent on Higg FEM scores; "If we drop below 70 points they freeze new orders until we recover" said the Procurement Manager of this company. While there may not be direct financial incentive for this, the pressure alleviates itself on the suppliers who can then do tighter, more efficient production, audit and reporting processes. On top of that, the government has enacted a law for submitting environmental reports in soft copy; thus laws like online application of environmental reports could be necessary to strengthen better compliance and accountability as the nascent stage of a formal institutional environment of GSCM in Bangladesh.

The firms do have some Mimetic pressure in how they interpret competition. The Environmental Manager for Company X, stated to Business Insider, "By the way, the buying and selling of leaders, these companies are institutional models for us; and now as buyers they are coming to visit to learn about us; they are able to see the model they are being built on". The only way in which global markets can be upheld as legitimate is to have the best

factories, like LEED Platinum certified factories in order for us to continue to be legitimate as well. Zhu, Sarkis, & Lai (2012) present a similar osmotic process, happening thanks to institutional learning that promotes sustainability at an industry-wide scale, but this time within developing countries.

Normative pressure is exerted from industry associations, professional training schools, and NGO partnerships with cleaner production standards. Both case companies are engaged in this type of training and learning as they also impart technical training and knowledge. These technologies engage in the cultural production of management values and a professional norm of environmental responsibility.

But, research also suggests that institutional pressure is dynamic. Firms are reactive- and often use GSCM to "luxuriate" existing buyer relationships or regulatory approval. This leads at some point to a stage in environmental practices where fundraising and donation become visible in the form of cost-cutting/efficiency. Scott (2008) proposes a transition from coerced compliance with these practices to normative commitment, noting that that as the practices become institutionalized, that is an externally imposed and continually self-renewing mechanism that changes the organizational practice.

Plus, the role of institutional pressures in driving the initial adoption process and the relevance of the absorptive capacity of the firm are key. Company X could bring to the client's agency; the client wanting to outsource the internalized learning. Due to lack of resources and the fact that their suppliers were insecure, Company Y was still dependent on outside counsel. This is in line with Awaysheh & Klassen (2010), who argue that firm capability, working in conjunction with institutional pressure, can also impact implementation levels of GSCM.

Third, Institutional Theory accounts for the adoption of GSCM by firms, but does not fully explain the kind of performance that these gains of performance are. This is for the mechanisms of NRBV acquired capabilities and learning. The two theories are integrated as in this specific thesis; Institutional Theory is the one to explain the beginning of the adoption, while NRBV explains how this adaptation is transformed in to sustained performance.

5.1.3. Diffusion and Ecological Modernization: The Spread of GSCM Practices

Closely related to the previous, third theory – Dispersion and ecological modernization- has looked at the diffusion of GSCM practices across industries and throughout a broader environmental modernization . This appears to be a "Diffusion Theory-type" process of awareness, trial, adoption and routinization of innovations . Along similar lines, the

sustainability argument goes that industrial modernization and environmental care go hand in hand (Mol & Spaargaren, 2000).

Their research reveals the Bangladeshi garment industry as undergoing a process of diffusion, at the stage of early adopters/ fast followers. In the case of Company X, that was an early adopter, the endogenous process of technology diffusion is represented by the use of the system and the certificates as models for other business to do the same. The Environmental Manager explains "...we've been asked to come look at smaller factories to see what digital dashboards do". Ecological modernization is distinctive for its emphasis on collective learning and for the way it emphasizes learning between industries.

Company C is exogenous diffusion from outside actors – is comprised of buyers, NGO's and/or associations bringing sustainability standards to suppliers. Because of this, its shared supplier audits, as well as their training sessions for PaCT1, incentivize knowledge sharing among users throughout multiple suppliers to the point where, as Zhu et al. (2012) argue, in "new economies, product/process diffusion can also happen through buyer-driven networks of cooperation, instead of by imitation by competitors" .

But, in the case of Bangladesh, diffusion is not socially isolated but rather social and relational. Practice spread through trust, learning and contracting rather than just certification. For instance, a very low cost pilot program of reverse-logistics proves that innovation can come from working collaboratively with the demand and supply side of the global market rather than enforcing it from above. This echoes Seuring and Müller (2008) who describe sustainable supply chains as a set of dependent, cooperative systems rather than a linear chain of command.

Both reflect a slow convergence to the ideals of superior environmental upgrading coupled with economic competitiveness characteristic of Ecological Modernization. Whether energy savings at Company X or reputation benefits for Company Y from compliance demoshowtainability is no longer an external cost but rather a strategic part of their operation. But, this is uneven; even as the front leading firms get closer to alignment, the smaller suppliers largely are trapped in financial, technical and infrastructure constraint; Govindan et al. Laos is no exception, as also claimed by in their research on contextually similar 'emerging countries' .

Also, digitalization is spurring diffusion as a way to help and to indicate. Such use of digital dashboards, ERP integration, and customer scorecards as transparent and measurable systems that allow for benchmarking and improvement represents a departure from the recent conception of "eco-digital capability" evidence in other research findings (Dubey et al.,

2019). The incorporation of technology also serves to render best practices "public, visible, and auditable," by rendering sustainability performances visible, comparable, and auditable.

5.1.4. Integrative Theoretical Synthesis

Bringing the three perspectives together yields a multi-level understanding of GSCM in Bangladesh's garment industry:

Analytical Level	Dominant Theory	Mechanism Focus	Illustration from Cases
Firm-internal	NRBV	Capability formation, resource efficiency	EMS, eco-design, digital monitoring (Company X)
Inter-organizational	Institutional	Buyer/regulatory pressure, legitimacy	Buyer audits, scorecards, supplier evaluation (Company Y)
Sectoral / Network	Diffusion & EM	Knowledge transfer, modernization, imitation	PaCT training, peer learning, recycling pilot

Table 18 Multi-level understanding of GSCM

Combined, these two layers account for variance and convergence. Those firms for which the capability exists are of the first to respond to different motivations than those coerced; but finally, they will ultimately become at the same place: 'mixing environmental and operational excellence as sources of competitive advantage'. This theoretical synthesis therefore supports the earlier consensus that sustainability transition in emerging industries is hybrid; it is, in fact, both capability-driven and institutionally-induced, in line with the established consensus on sustainability transition (Seuring & Müller, 2008; Golicic & Smith, 2013).

5.2. Contributions to Literature

The research is essential to the growing literature of Green Supply Chain Management and sustainable performance in several key ways. The results also shed light on the theoretical and empirical implications of green practices in the performance outcomes of resource constraint, buyer constraint contexts from Bangladeshi garment industry.

5.2.1. Extending Mechanism-Based Understanding of GSCM

First, the research enriches GSCM theory by providing a mechanism-based explanation for the links between practice and performance. Prior studies have widely concluded statistically significant relationships between GSCM and firm performance, but few have even learned

the implications of such relationships in actual organizational settings. As discussed within-case analysis, this study identifies the sequential pathway:

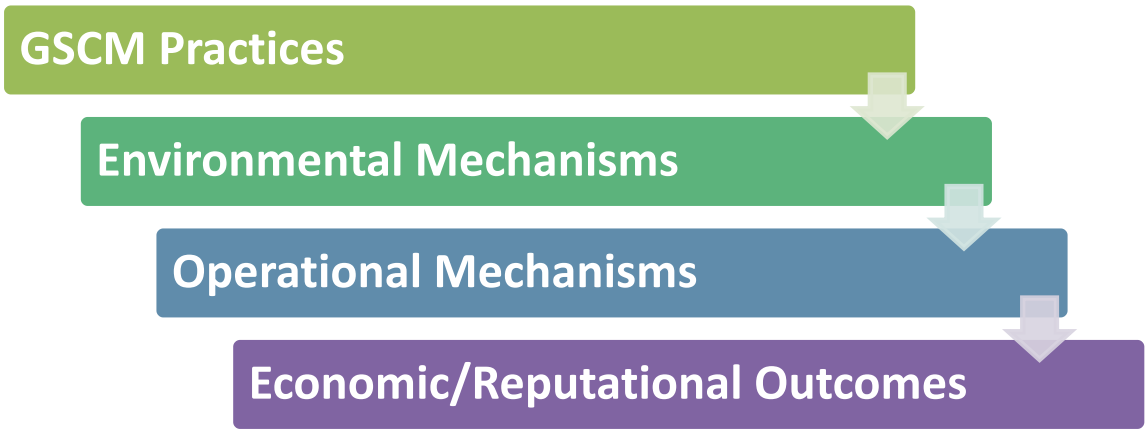


Figure 28 Mechanism-Based Understanding of GSCM

This causal chain confirms the utility of environmental improvements such as clean processes and waste reduction, enabling operators to function more reliably and achieve greater process efficiency through cost and reputation benefits. These qualitative data further refine the theoretical horizon from correlation to process level explanation, which Golicic and Smith (2013) emphasized.

5.2.2. Contextualizing NRBV, Institutional, and Diffusion Perspectives

Second, this study contextualizes classical theories of GSCM within the emerging-economy context. The NRBV's focus on firm-specific capabilities is expanded to include buyer dependency and network diffusion. Company X documents the potential role of internal systems to turn into valuable and inimitable capabilities in Hart, 1995, and Company Y indicates that, in supply chain environments of global buyers, coercive and normative pressures are substituted for internal capability in supply chains highly highly regulated by global buyers, an intersection rarely examined empirically (Zhu et al., 2012; Awaysheh & Klassen, 2010).

This combination of capability driven and institutional driven pathways suggests that implementation of GSCM is not uniform but dependent upon contextual maturity, and Laari, Töyli, and Ojala (2018) argue that alignment of strategy–capability leads to sustainable performance outcomes.

5.2.3. Empirical Contribution: Evidence from Bangladesh

Third, the findings from this thesis will give new insights from Bangladeshi garments and is critically underrepresented in GSCM research. Most of the previous literature focuses on Chinese, Indian, or Western manufacturing companies (Zhu et al. 2012) . In contrast, this study provides an extensive qualitative analysis of two Bangladeshi manufacturers, with different ownership and market structures, which provides an insight into how global supply-chain pressures are intertwined with local institutional spaces.

This data demonstrates that environmental initiatives can thrive even if they are financially and architecturally fragile; they can thrive when complemented by digital monitoring, buyer collaboration, and leadership. This further enhances GSCM in developing economies as it demonstrates that capacity accumulation and institutional alignment are mutually reinforcing, not mutually exclusive, but mutually empowering.

5.2.4. Methodological Contribution

Finally, the results show the utility of multi-level qualitative process analysis for GSCM research. This study uses multiple environmental, operation, procurement and quality managers as a source of richer insight into the lives of sustainability change by twinning the narratives used by the various informants and by making them more detailed. A practical contribution to this methodology, as Seuring and Müller (2008) called for “thicker” qualitative evidence in the presence of quantitative surveys to counter the dominance of quantitative GSCM surveys. The result is a transferable analysis tool that can be applied to future mechanisms-tracing research.

5.3. Managerial and Policy Implications

This study also provides real-world insight for managers, industry associations, and policy makers in Bangladesh and other emerging economies. But, this study demonstrates how external pressure triggers green adoption, internal systems, data infrastructure and human engagement, determining whether green practices can yield lasting impact.

5.3.1. For Factory Managers

Sustainable sustainability has been integrated into core KPIs. In order to reflect production quality, quality and procurement performance indicators, these environmental goals should also be included. To illustrate the benefit of real-time monitoring, Company X’s dashboard model shows the increased accountability and improvement.

Digital measurement and feedback are useful in gaining investments. Digital dashboards and ERP-based tracking can help identify the inefficiencies early. Visibility, as shown by both

firms, provides a quicker remedy to corrective actions and greater confidence in communication to buyers (Dubey et al., 2019).

Efficiency gains can be reinvested in upgrading capability. Savings in water, energy or waste should cover other technological and training investments. The “virtuous cycle” maintains environmental and operational improvement (Green et al., 2012).

Participation empowers employees. Monthly green meetings, idea contests and incentive programs increase ownership. Participant B’s experience, “They feel proud when their idea saves power,” demonstrates that cultural engagement is as important as technology.

5.3.2. For Buyers and Global Brands

It moves from compliance to partnership. Co-investing in supplier training and technology as part of Company Y’s PaCT initiatives increases capabilities.

Keeping long-term contracts. Green investment takes time to pay off; long-term sourcing agreements encourage suppliers to pledge environmentally sustainable efforts.

Harmonize reporting rules. As a result, a lack of common audit protocols drains resources. A single sustainability scorecard would reduce duplication and ensure greater transparency.

Reward demonstrated performance. In sourcing decisions, buyers should include sustainability achievements as well as positive reinforcement to foster diffusion, rather than punishment alone.

5.3.3. For Industry Associations and Policymakers

The strengthening of sectoral training ecosystems. The BGMEA, Department of Environment and donor agencies should increase PaCT-style programs to accommodate small suppliers.

Encourage green investments. The results of Govindan and others, 2015, argue that low interest “green loans” or tax rebates can help SMEs be more flexible in their energy-saving practices (Govindan et al., 2015).

Support the digital infrastructure for data integration. An integrated digital reporting system would improve compliance between buyers and regulators and reduce the complexity of a system.

Reward the pilots of the circular economy. In Company Y, such recycling and take-back measures could be replicated nationally in public-private partnerships.

5.4. Future Research Directions

This limitation presents some positive prospects.

Longitudinal studies on maturity in capacities. On-site monitoring of firms over time may indicate the shifting sensitivity of early compliance to strategic sustainability and whether mediation increases with experience (Laari et al., 2018).

Evaluation of the mechanism framework quantitatively. The causal model illustrated in Figure 4.2 is possible to be applied for survey testing using SEM or PLS-SEM over larger samples (Green et al., 2012).

Cross-country comparative research. Comparing Bangladesh with other emerging garment exporters like Vietnam and Cambodia would be helpful to learn about the shape of national institutions that affect GSCM diffusion.

integrated digital and social sustainability. Future studies could also investigate how digitalization (AI, blockchain) interacts with environmental and social supply-chain dimensions (Dubey et al., 2019).

Study of buyer–supplier dyadic. Rao & Holt 2005 reported on the interconnection between supply relations, sharing data from both sides of supply relations to further understanding of mutual trust, knowledge transfer and co-innovation processes (Rao & Holt 2005).

Circular-economy and reverse logistics scaling. These data would be useful to verify the economic feasibility and governance of large-scale recycling and material recovery networks in the RMG sector.

5.5. Limitations of the study

All research is defined through a set of interpolation limits. Understanding these limitations provides validity and clarity in the findings.

Small sample size. For the second part of this study, the authors analyze two companies which are information-rich but not generalizable. The cases were used as contrast rather than representativeness. Future research should extend the framework to more firms, and to second-tier suppliers.

Cross-sectional timing. Data was collected at one point in time. Longitudinal studies could shed light on the evolution of mechanisms as green investments develop and market conditions change (Hart & Dowell 2011).

Self-reported data. As drawn from documents and secondary sources, it relies on managerial biases, which, if taken in light of social desirability bias, include managerial perceptions. In addition, buyer or auditor perspectives could improve credibility.

Sectoral focus. This study is focusing on the garment industry but it may not apply fully to different supply-chain dynamics (i.e. logistics, electronics). Future studies could attempt to test transferability across industries.

A focus in the environment. While this study focuses on environmental GSCM practices, it also explores social and labor dimensions, such as worker welfare or gender equality, that contribute to sustainability performance.

5.6. Conclusion

This study examined how Bangladeshi garment manufacturers operate GSCM practices and how these practices impact environmental, operational, and economic outcomes. I combined NRBV, Institutional, and Diffusion approaches and found two different, but complementary pathways: capability-driven transformation (Company X) and institutionally driven adaptation (Company Y).

The results show that environmental management, eco-design and supplier collaboration are not merely physical improvements in performance but are not simply environmental and operational mediation, validating the mechanism chain Green et al. (2012). By providing this mediation within the systems, digitalization, and learning culture, external pressures and collaboration form a barrier to diffusion across networks.

The results also extend understanding of GSCM and tie firm-level capabilities to institutional and network-level dynamic. It managerially shows the difference that sustainability is not just compliance but strategic ability that boosts competitiveness, reputation and long-run resilience.

To wrap up, the evolution of GSCM as an environmental policy and economic development in Bangladesh reflects the overall transformation of ecological modernization: environmental responsibility and economic growth no longer serve against each other, but both reinforce and support ways to sustainable industrial development. The next decade will determine the extent of these practices spread across the sector and whether firms can bring green compliance into green competition.

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APPENDICES

Appendix1. Interview Guide and Participant Overview

A. Interview Overview Table

Company	**Participant Code**	**Position**	**Main Focus Area**	**Interview Mode**	**Duration (min)**	**Key Themes Identified**
Company X	A	Environmental/Sustainability Manager	Internal environmental management, eco-design, EMS, performance outcomes	Zoom	50	ISO 14001, water reuse, eco-design integration
Company X	B	Operations Manager	Operational performance, digital dashboards, process improvement	Zoom	42	Real-time dashboards, cost savings, automation
Company Y	C	Procurement & Supply Chain Manager	Supplier collaboration, green purchasing, buyer requirements	Zoom	38	Buyer audits, supplier co-learning, recycling
Company Y	D	Production & Quality Manager	Reverse logistics, recycling, and process optimization	Zoom	**35**	Energy tracker, defect reduction, reputation gain

B. Semi-Structured Interview Guide

The following key questions guided the semi-structured interviews used for data collection. Probing questions were added during each session to capture detailed experiences and examples.

1. Introduction and Background

- Could you describe your role and your company's main sustainability responsibilities?
- What motivated your organization to adopt green supply chain practices?

2. Internal Environmental Management

- What systems or policies (e.g., ISO 14001, EMS) are used to manage environmental performance?
- How do you set, monitor, and review environmental targets?

3. Eco-Design and Resource Efficiency

- What design or process changes have been introduced to reduce waste and resource use?
- How do you measure success in these initiatives?

4. Supplier and Customer Collaboration

- How does your company collaborate with suppliers or customers to improve environmental performance?
- Could you share any specific project examples or joint programs?

5. Reverse Logistics and Circular Practices

- What happens to waste materials or rejected items?
- Are there any recycling or take-back initiatives in place?

6. Outcomes and Challenges

- What environmental and operational improvements have resulted from these practices?
- Have these changes led to any financial or reputational benefits?
- What challenges have you faced in maintaining or expanding sustainability initiatives?

7. Digital Enablement and Institutional Pressure

- What role do digital systems play in tracking or reporting sustainability data?
- How do buyer or regulatory pressures affect your environmental decisions?

8. Reflection

- Looking forward, what future goals does your organization have for improving green supply chain practices?

C. Notes on Ethical Considerations

- Participation was voluntary, and all interviewees provided verbal consent.
- Company and participant names are anonymized as Company X/Y and Participant A–D.
- Interview data were stored securely in encrypted digital folders.

Appendix2 Codebook

Main Theme	**Sub-Code / Example**	**Description**	**Linked Theory**	**Evidence Source (Participant / Quote)**
Internal Environmental Management	ISO 14001, EMS goals, digital dashboards	Internal systems that guide sustainability performance and compliance	NRBV	A, B – "We recycle 60% of process water…"
Eco-Design	Low-liquor ratio dyeing, CAD layouts	Design innovations reducing materials and energy	NRBV	A – "Eco-design starts before production…"
Supplier Collaboration	Joint audits, corrective actions, green procurement	Buyer-supplier partnerships for sustainability	Institutional	C – "We share buyer sustainability requirements…"
Reverse Logistics	Scrap recycling, packaging reuse	Recovery and reuse of materials	Diffusion	C – "We partnered with a local recycler…"

Operational Performance	Downtime reduction, defect rates, energy savings	Efficiency and quality improvements	NRBV	B, D – "Cleaner inputs give clean outputs…"
Institutional Pressure	Buyer audits, certifications	Coercive and normative pressures from buyers	Institutional	D – "Buyer visits are intense but helpful…"
Digital Enablement	Higg Index, energy dashboards	Technology used for measurement and coordination	Diffusion	B, D – "Data visibility changed everything…"
Economic & Reputational Outcomes	Cost savings, recognition, buyer trust	Financial and legitimacy benefits of GSCM	NRBV + Institutional	A, C – "Buyers increased long-term orders…"