THESIS FOR THE DEGREE OF LICENTIATE OF ENGINEERING

CIRCULAR LOGISTICS SERVICES

CONCEPTUALIZATION, CONFIGURATION AND VALUE-CREATION

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Department of Technology Management and Economics

CHALMERS UNIVERSITY OF TECHNOLOGY

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"Not all those who wander are lost"
J.R.R Tolkein

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ABSTRACT

The transition from a linear to a circular economy (CE) demands logistics services that extend beyond the forward or reverse movement of goods to enable multi-directional, multi-loop resource circulation. Despite growing scholarly attention to the intersection of logistics and CE, the field exhibits two interrelated gaps that limit the understanding of the logistics service in CE. The first is conceptual: reverse logistics (RL) remains the dominant framing for logistics in CE, yet its unidirectional, single-lifecycle scope does not capture the multi-actor, multi-directional, and multi-loop resource circulation demands from CE. The second is configurational: even if a broader concept were established, the field has neither assessed whether existing logistics actors can deliver on it nor explained through what conditions and configurations logistics services create value in CE. These are two dimensions of the same problem: designing logistics services in CE requires understanding both who can provide what services and how the service provision translates into value. This thesis addresses both gaps with the purpose of developing a conceptual foundation for understanding logistics services in CE through three studies. The first study is a systematic literature review conceptualizing circular logistics services (CLS); the second study is a contingency theory-based content analysis assessing logistics service buyer-provider fit; and the third study is interview-based, examining CLS value creation through service-dominant logic and the logistics utility concept.

The findings characterize CLS as a distinct logistics service phenomenon in three ways: (i) by extending RL through three building blocks and a formal definition that captures the multi-actor, multi-loop and multi-directional resource circulation aspects of CE; (ii) by establishing that no single provider type achieves fit across strategic, functional, and capability levels simultaneously; and (iii) by reconsidering the logistics utility framework, where form utility shifts to become the central logistics function in CE. The findings further show that CLS creates value through its own service logic rather than as operational support. This service logic comprises four conditions (specialist knowledge, material properties, dual-value logic, and institutional arrangements) that shape how value is created, giving rise to five CLS archetypes that capture distinct value-creating configurations, formalized through seven propositions.

The thesis contributes to CE and logistics literature by introducing CLS as a distinct service concept, adding a three-layer fit concept to contingency theory for logistics service buyers and providers, reconfiguring the logistics utility framework, and qualifying service-dominant logic for material-intensive CE contexts.

Keywords: *Circular logistics services, Circular economy, Circular supply chains, Reverse logistics, Logistics services, Logistics utilities, R-framework, Service-dominant logic, Contingency theory.*

LIST OF APPENDED PAPERS

Paper 1

Altuntas Vural, C., Shafi, S., Halldórsson, Á. (2025).
Circular Logistics Services: More Than a New Name for Reverse Logistics

Status: Under revision in an academic journal.

Author Contribution: Altuntas Vural developed the initial idea for the paper. Halldórsson contributed to the discussion of its key theoretical aspects. Altuntas Vural and Shafi jointly carried out the data collection, analysis, and writing. All authors participated in the review and discussion of the manuscript.

Paper 2

Shafi, S., Altuntas Vural, C. (2025).
Logistics Services in a Circular Economy: Finding the Fit between Logistics Service Buyers and the Providers.

Status: Under revision in an academic journal.

Author Contribution: Altuntas Vural developed the preliminary idea for the paper. Shafi was responsible for the theoretical development, conceptualization, data collection, data analysis, and led the writing of the manuscript. Both authors engaged in extensive review and discussion in preparation for journal submission.

Paper 3

Shafi, S., Altuntas Vural, C. (2026).
Creating Value with Circular Logistics Services

Status: Full paper submitted to NOFOMA 2026 conference.

Author Contribution: Shafi had primary responsibility for the conceptualization, data collection, and analysis, and led the initial writing of the manuscript. Altuntas Vural contributed extensive reviews, revisions and actively took part in the writing of the conference version of the paper.

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First and foremost, I am grateful to the Swedish Energy Agency (Energimyndigheten) for funding my PhD project. Without this, nothing would have happened.

My PhD journey did not start out of nowhere. I grew up in a family where education was given the utmost priority, and from early childhood I was heavily influenced by my grandmother, who also raised me until her demise. She was a Professor of History with a long academic career, and my first teacher. She often shared stories from higher education abroad, and somehow those moments shaped me such that, from the age of four or five, I dreamt of pursuing the highest degree achievable. The first big thanks, therefore, goes to my late grandmother. I wish you could see me getting my PhD.

Dreams don't come true without the support of loved ones. To my parents, who have given everything to make sure I had access to the best education possible: I wouldn't have reached this stage without you. My sister and my in-laws have played bigger roles than they probably realise. And at the risk of putting the most important name last, my PhD journey would not have been this smooth without the love of my life, my wife Anika. Her mental support is what keeps me going even in the most demotivating times; she is as much a part of this thesis as I am. And an added thanks to you for making the best coffee in the world, which is the diesel for any PhD student.

I came to Sweden for my Master's right after my Bachelor's, and the shift in teaching-learning regime (a term I've borrowed from a Lund course) fascinated me enough that I decided to pursue my PhD here. To my former supervisors and teachers in Lund, Yulia, Henrik, and Martin: I will never forget how much you helped me academically. Another big thanks goes to Sofia, my master's thesis partner, who has been with me since my very first day in Sweden and even drove me to Chalmers for my final PhD interview. You are a true friend.

Then I joined Chalmers. The first person to greet me here was Violeta, the kindest soul I've met at Chalmers. You supported me in my lowest times in ways you probably don't even know. Thank you.

To my supervisor, Ceren, if I started writing about you properly, I'd need another fifty pages you would never allow. So, in short, I am blessed to have you as my supervisor. I aspire to be like you. You have set the bar so high as a mentor that I don't think I'll ever find another like you (which means even after I graduate, I'll still be knocking on your door in every ten minutes). You are the best supervisor, a PhD student can ask for.

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Shazbah Shafi,
Gothenburg, 2026.

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List of Abbreviation

3PL	Third Party Logistics
CBM	Circular Business Model
CE	Circular Economy
CLS	Circular Logistics Services
CLSC	Closed-loop Supply Chain
CR	Critical Realism
CSC	Circular Supply Chain
EoL	End of Life
EPR	Extended Producer Responsibility
FL	Forward Logistics
LSB	Logistics Service Buyers
LSP	Logistics Service Providers
OLSC	Open-loop Supply Chain
PPWR	Packaging and Packaging Waste Regulation
RL	Reverse Logistics
SCM	Supply Chain Management
SDL	Service Dominant Logic
SLR	Systematic Literature Review

1. INTRODUCTION

This licentiate thesis is part of the research project *CIRCLOG: Facilitating Continuous Resource Flows through Circular Logistics Services*, funded by the Swedish Energy Agency (Energimyndigheten) under the RESource 2023 programme: *Cirkulär ekonomi och resursanvändning inom planetens gränser*. The project focuses on building knowledge on the skills, capabilities and service structures that are needed to develop effective circular logistics services (CLS). The broader doctoral project investigates CLS across three interrelated domains: service system domain, actor domain, and their synthesis. This licentiate thesis primarily addresses the service system domain by conceptualizing CLS, examining the fit between logistics service providers (LSPs) and logistics service buyers (LSBs), and exploring how CLS is configured to create value. Service systems involve multiple actors, therefore LSPs, shippers, and other stakeholders appear throughout the discussion, but the focus remains on the services they provide and participate in.

The present chapter introduces the research context and the scope, outlines the research purpose and questions, and provides an overview of the thesis structure.

1.1. Research Background

In a linear economy, raw materials are extracted, transformed into products, consumed, and ultimately discarded as waste, following a take-make-dispose trajectory in which resource depletion and waste generation are systematically externalized rather than priced into production and consumption decisions (Velenturf & Purnell, 2021). Circular economy (CE) represents a systemic alternative to this model. Rather than disposing of products at end of use, CE aims to keep products, components, and materials in circulation at their highest utility for as long as possible through strategies such as reuse, repair, remanufacturing, and recycling (Kirchherr et al., 2023; The Ellen MacArthur Foundation, 2013). Where the linear model creates value through throughput volume, CE seeks to create, retain, and recover value by closing, slowing, narrowing, and regenerating material loops across economic systems (Bocken et al., 2025). The transition from linear to circular is therefore not an incremental improvement in resource efficiency but a structural reconfiguration of how materials flow through the economy, with profound implications for the logistics systems that enable those flows. Building on this context, this research is motivated by both practice and scholarly research. The first one explains the real-word situation development the logistics must respond to and the later explains how and why the academic literature is lacking.

1.1.1. From Practical Perspective

The European economy remains overwhelmingly linear, dependent on continuous raw material input to sustain economic activity and industrial production, while generating material output that is largely neither recycled nor reused, resulting in in continued dependence on energy-intensive primary material production and raw material imports

(European Environment Agency, 2024). Despite a decade of policy attention, Eurostat data show that the EU's circular material use rate reached only 12.2% in 2024, an increase of barely 1% since 2015 (Eurostat, 2025). At the current trajectory, the EU will fall significantly short of its ambition to double that rate to approximately 23% by 2030, a target set in the 8th Environmental Action Programme and confirmed in the Clean Industrial Deal (European Environment Agency, 2025). The picture is even stronger at the national level: in Sweden, only 3.4% of resources are cycled back into the economy, leaving a circularity gap exceeding 96%, meaning the vast majority of resources consumed are drawn from virgin sources (Circularity Gap Report-Sweden, 2022). Swedes consume around 25 tonnes of materials per person each year, more than twice the global average. Per-capita resource extraction is among the four highest worldwide (Circularity Gap Report-Sweden, 2022). Industry has begun to respond. Circular Sweden, a forum of major material-flow actors such as IKEA, H&M, Electrolux, and NCC, mobilize around circular design, sustainable consumption, and circular value chains (*Circular Sweden*, n.d.). Swedish business organizations have also pushed for policy instruments that remove barriers to market-driven circular solutions (Wangel et al., 2024) . Yet commitment has not translated into capacity. The operational infrastructure needed to realize these ambitions remains underdeveloped.

The gap between ambition and reality signals a systemic implementation discrepancy that CE is not failing for lack of vision but for lack of operational infrastructure to circulate materials at scale. To address this issue with excessive raw material use, European policymakers have responded with an accelerating regulatory plan. The second Circular Economy Action Plan (European Commission, 2020), a centerpiece of the European Green Deal, introduced measures across the entire product lifecycle, from eco-design to waste prevention. Since then, sector-specific regulation has intensified. The EU Batteries Regulation, adopted in July 2023, mandates sustainability and circularity requirements across the battery lifecycle, including collection obligations and recycled content targets (European Union, 2023). The Regulation on Packaging and Packaging Waste (PPWR) entered into force in February 2025, harmonizing reuse and recycling standards across member states and strengthening extended producer responsibility (EPR) frameworks (European Union, 2025). The EU Strategy for Sustainable and Circular Textiles, adopted in 2022, targets the full lifecycle of textile products and is being operationalized through a forthcoming EPR regime requiring producers to finance collection, sorting, and recycling infrastructure (European Commission, 2022). The Ecodesign for Sustainable Products Regulation, adopted in June 2024, extends product-level sustainability requirements to virtually all physical goods and introduces digital product passports for material traceability (European Union, 2024). Most recently, in August 2025, the European Commission launched a public consultation on a Circular Economy Act intended to consolidate and broaden these measures (European Commission, 2025).

What stands out in this regulatory progression is its growing logistics demand. Each of these policy measures assumes operational capabilities that do not yet exist at scale: reverse collection systems for batteries and textiles, sorting and grading infrastructure capable of handling heterogeneous return flows, redistribution networks for reusable packaging, traceability systems linking product passports to physical material flows, and coordination mechanisms spanning multiple actors and supply chains. These are not incremental adjustments to existing system rather require systemic innovation (Zils et al., 2023). Hence, the transition to CE demands supply chain configuration that move beyond the efficient forward flow of goods to enable multi-directional, multi-lifecycle resource circulation (Batista, Bourlakis, Smart, et al., 2018b; Farooque et al., 2019). These circular supply chain (CSC) structures, in turn, rely on logistics services capable of coordinating flows across cycles, chains, and actors.

Industry actors are responding, but unevenly. Traditional LSPs, whose competitive advantage has historically rested on transportation capacity, route optimization, and cost efficiency (Fabbe-Costes et al., 2009; Selviaridis & Spring, 2007), need to leverage their extended operating scope and capabilities when confronted with CE requirements (Mate et al., 2026). These requirements demand sorting expertise, reconditioning knowledge, asset tracking across use cycles, and coordination with actors outside conventional supply chain boundaries. At the same time, non-traditional actors such as waste management companies, remanufacturers, digital platforms (Blackburn et al., 2026), and sector-specific intermediaries, are increasingly performing logistics-like functions such as collection orchestration, sorting, storage, and redistribution, sometimes competing with and sometimes complementing conventional LSPs (De Angelis et al., 2018; Henry et al., 2020; Hopkinson et al., 2020). While proprietary, OEM-specific cycles may be necessary in the early stages of CE adoption, replicating closed systems across individual manufacturers risks creating parallel infrastructures that exclude third-party LSPs and other actors resulting in limited efficiency, resilience, and scalability (Hansen & Revellio, 2020). The result is a fragmented operational landscape in which the logistics capabilities required for CE are distributed across actors who often lack mutual visibility (Sonar et al., 2024), operate under different institutional logics (Calzolari et al., 2022), and have not yet developed the collaborative structures (Köhler et al., 2022) needed to coordinate circular material flows at scale.

These practical gaps along with the recent developments in CE both in policy level and industry level, motivate the present research. Given that the logistics services required for the CE transition remain underdeveloped and fragmented, understanding what those services consist of, who can provide them, and how they create value becomes a necessary step toward enabling the circular transition.

1.1.2. From Theoretical Perspective

The practical developments described above have generated growing scholarly attention to the intersection of logistics and CE. Yet the academic literature exhibits two interrelated gaps that collectively limit a coherent understanding of what logistics services for CE consist of, how they are organized, and how they produce value.

First, there is a conceptual gap. The principal logistics concept applied to CE has been reverse logistics (RL), concerned with the return of products, components, and materials from points of consumption back to points of recovery or disposal (Rogers &

Tibben-Lembke, 1999). This idea although now became almost three decades old, is not fundamentally changed (more details in Chapter 2.2). RL literature has evolved along these years and generated substantial knowledge on managing commercial returns (Bernon et al., 2011, 2018), recapturing residual value from end-of-life products (Bouzon et al., 2014), and being an important part of closed-loop supply chains (CLSC) (Guide & Van Wassenhove, 2009; MahmoumGonbadi et al., 2021). However, RL is inherently unidirectional, operating along a single reverse trajectory and typically bounded by individual firms or dyadic supply chain relationships (Butt et al., 2024; Mallick et al., 2024). CLSC models broaden this by linking forward and reverse channels (Mishra et al., 2023), yet they remain structurally closed systems that struggle to accommodate the cascading, multi-loop resource flows that CE demands (Sehnem et al., 2019). Hence CSCs emerged that aligns with the CE requirement of material circulation within, between, and across supply chains, involving diverse recovery strategies operating simultaneously at product, component, and material levels in multiple directions (Farooque et al., 2019; Kirchherr et al., 2023). Based on the CSC literature that established the multi-level network structures and collaboration among actors that have not traditionally operated within the same supply chain (Batista, Bourlakis, Liu, et al., 2018; Farooque et al., 2019; Hazen et al., 2020), it is inferred that the logistics literature lacks a concept that moves beyond the reverse direction to capture the full scope of logistics activities required for CE.

The second is a configurational gap. The term *configuration* is used throughout the chapters as a descriptive term for the combinations of activities, structures, and actors that make up CLS. Understanding these configurations requires going beyond the question of what logistics services in CE consist of. Two further problems remain unaddressed, and they are closely connected. The first concerns the actors expected to deliver and receive CLS. While LSPs are increasingly positioned as potential CE enablers due to their cross-chain visibility, asset bases, and coordination capabilities, their actual engagement remains uneven and often confined to emergent, fragmented, or green-logistics-framed services shaped by evolving customer demands and regulatory pressures (Mate et al., 2026). Over time, LSPs have evolved from basic transportation operators to providers of integrated, value-added service packages (Andersson & Norrman, 2002; Fabbe-Costes et al., 2008; Selviaridis & Spring, 2007). Yet this evolution has been shaped by the demands of linear supply chains, namely speed, cost efficiency, and reliability of forward flows (Christopher, 2016). Whether these same providers, or alternative actor types such as waste management firms and recycling operators, possess the capabilities needed to support circular material flows has not been systematically examined. The logistics requirements that emerge when firms adopt circular strategies, including collection of heterogeneous return streams, sorting and grading under uncertainty, and coordination across multiple recovery channels, are different from those that are shaped by linear economy (Opstal & Mejía-Vélez, 2026). Without a structured assessment of how the logistics service demand and supply align in CE, the field cannot identify what actor configurations are needed or where the critical gaps lie. A second closely related problem concerns "value". In linear supply chains, the value contribution of logistics is well understood through cost efficiency, service reliability, and the ability to deliver the right product in the right condition at the right time (Lambert, Stock, et al., 1998; Mentzer et al., 1989; Stank et al., 2003). This understanding, however, was built for a context in which materials flow in one direction and value is assessed accordingly (Christopher, 2016). CE introduces a fundamentally different value logic, one oriented toward preserving, recovering, and regenerating resource value across multiple use cycles (Bocken et al., 2025; The Ellen MacArthur Foundation, 2013). The dominant vehicle for realizing value in CE has been the circular business model, which reconfigures value creation through strategies such as product life extension, sharing platforms, product-as-a-service, and resource recovery (Bocken et al., 2016, 2025; Geissdoerfer et al., 2018; Lüdeke-Freund et al., 2019). While this work has advanced understanding of circular value strategies, its treatment of logistics remains instrumental: logistics appears as the operational function that executes circular strategies rather than as a service system that actively shapes circular value outcomes. This framing is evident, for example, in Hopkinson et al. (2020), who position reverse network management as one of four building blocks of circular value, and in Jayarathna et al. (2023), who examine how the logistics sector adopts CE practices rather than how logistics services constitute circular value. The actor question and the value question are connected because how well actors align determines the conditions under which value-creating configurations can emerge, and how value is created in turn shapes what capabilities actors need. Together, they form a single configurational gap of understanding the conditions under which CLS configurations emerge and an account of how those configurations create value.

These two gaps, conceptual and configurational, are not independent. They represent a progressive unfolding of the same underlying problem: the absence of a coherent scholarly foundation for understanding the logistics service function in CE. The conceptual gap (what the logistics service in CE consists of) must be addressed before the configurational gap (how it is organized, under what conditions, and how it creates value) can be meaningfully examined. Moreover, both gaps point toward the same conclusion: RL, while foundational, is insufficient as the organizing concept for the logistics demands of CE. The multi-directional, multi-lifecycle, and multi-actor nature of CE demands an expanded conceptualization.

1.2. Research Scope, Purpose and RQs

1.2.1. Research Scope

The previous section established that the logistics services in CE faces two interrelated gaps and concluded that an expanded conceptualization on CLS, is needed. Before formalizing the research purpose, it is necessary to specify what this thesis studies and where its boundaries lie. This involves two repositioning: first, locating CLS within the broader CE literature to explain why logistics services are the appropriate focal point; and second, delimiting the analytical scope to logistics services within the wider domain of supply chain management (SCM).

CE, which focuses on closing, slowing, narrowing, and regenerating material and energy loops (Bocken et al., 2025), requires a fundamental change in traditional production and distribution systems that have historically relied on extensive resource extraction and waste generation. To operationalize this change, different circular business models (CBMs) have been developed (Lüdeke-Freund et al., 2019) based on the waste hierarchy or R-frameworks that replace the end-of-life concept with strategies for reducing, reusing, repairing, remanufacturing, and recycling materials throughout their lifecycles (Kirchherr et al., 2017; Reike et al., 2018). These CBMs, however, do not operate in isolation. They depend on well-functioning CSCs, defined as coordinated forward and reverse supply chain structures that aim to deliver value across prolonged product and material lifecycles (Batista, Bourlakis, Smart, et al., 2018b; Farooque et al., 2019). And CSCs, in turn, depend on logistics services to facilitate the coordinated resource flows they require. CLS is thus positioned at the operational foundation of the CE architecture that CBMs promise, and CSCs are designed to coordinate.: without it, circular strategies remain aspirational and CSCs remain structurally incomplete.

Since logistics research is frequently rooted in SCM knowledge (Christopher, 2016), the boundary between the two requires clarification. Carter et al., (2015) distinguish between primary and support supply chains where an actor occupies the primary chain when actively involved in physical product flows, and the support chain when facilitating those flows through coordination or information. LSPs hold a dual position, acting as primary members when physically handling and transforming materials, and as support members when coordinating or enabling flows without direct material contact. This dual role is particularly relevant in CE, where logistics extends well beyond transportation to include sorting, grading, reconditioning, and multi-actor coordination. The present thesis focuses on the logistics services in this expanded sense, encompassing both its physical and coordinative dimensions. While SCM concepts inform the analysis throughout, the unit of analysis is the logistics service, not the supply chain as a whole. It should be acknowledged that the terminology in this domain involves inherent overlaps between concepts such as CE, CSC, CLSC, and RL (Sehnem et al., 2019), which Chapter 2 addresses in detail. Figure 1.1 shows the research scope that includes the interrelated concepts along with their abbreviations.

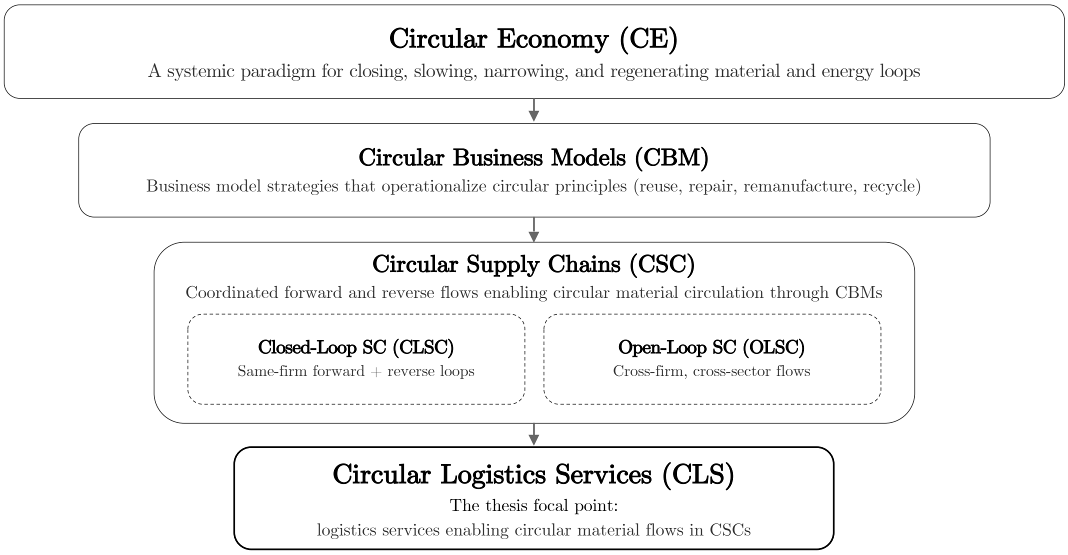

Figure 1.1: Research scope: narrowing from circular economy to circular logistics services

1.2.2. Research Purpose and RQs

Building on the research background and scope established above, the purpose of this thesis is:

To develop a conceptual foundation for understanding logistics services in circular economy.

The conceptualization of multi-directional, multi-lifecycle, and multi-actor flows in CE is termed as *circular logistics services* (CLS) in this thesis. The purpose is operationalized through two research questions (RQs).

RQ1: *How can CLS be characterized as a distinct logistics service phenomenon?*

RQ2: *How are CLS configured to create value in circular economy, and what conditions shape these configurations?*

The thesis addresses these questions through three appended papers that employ complementary methods and theoretical lenses. Each paper contributes to both research questions with varying intensity. Figure 1.1 illustrates this operationalization.

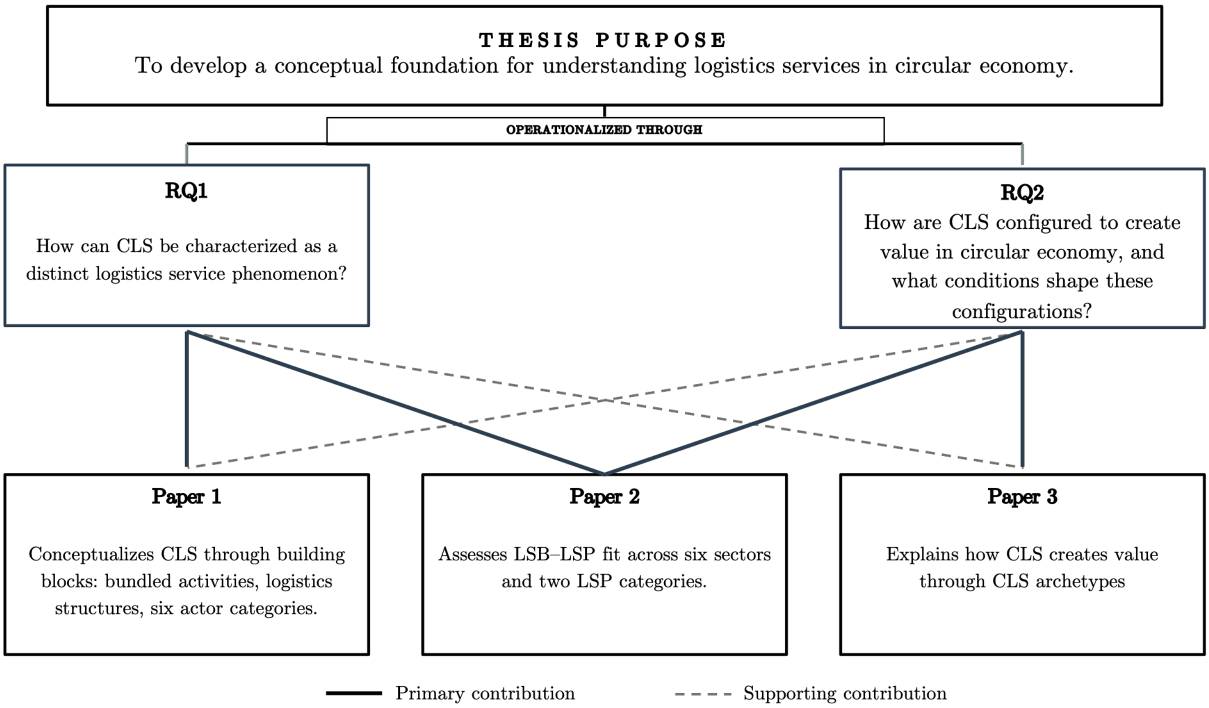

Figure 1.2: Operationalization of the thesis purpose through RQs and appended papers

Paper 1 conducts a SLR to conceptualize CLS through three building blocks and develops a definition that distinguishes CLS from RL. Its primary contribution is to RQ1, where it provides the conceptual foundation. It also contributes to RQ2 by establishing the vocabulary through which service configurations are described and the building blocks become the elements being configured.

Paper 2 through content analysis assess the fit between logistics service buyers and providers across six sectors. It contributes to RQ1 by grounding the characterization of CLS against corporate practice, showing where the logistics market's existing categories match or fail to match the building blocks. It contributes to RQ2 by identifying the sector-dependent fit patterns that constrain which service configurations are feasible.

Paper 3 through an interview-based study investigate how CLS creates value. Its primary contribution is to RQ2, where it identifies five CLS archetypes to explain the logistics-service-value connection. It also contributes to RQ1 by revealing operational characteristics, particularly the centrality of form utility and the role of assessment capability, that deepen the characterization of CLS beyond what the SLR and content analysis capture.

The three papers employ different methods and theoretical lenses matched to the dimension of CLS each examines. This multi-theoretical design follows from the nature of the phenomenon: characterizing a service concept requires conceptual synthesis and empirical grounding, while explaining its value creation requires practitioner engagement and theoretical integration.

1.3. Thesis Outline

The remainder chapters of this thesis are organized as follows.

Chapter 2 presents the theoretical framework and key concepts. It explains how two concepts (logistics as a service concept and CE) along with their analytical lenses, and two theories (contingency theory, and service-dominant logic), are integrated into a coherent theoretical framework.

Chapter 3 describes the research philosophy, research process, and methodological considerations detailing the research design, data collection, and analytical procedures employed across the three studies.

Chapter 4 provides a summary of each appended paper, presenting their main individual findings.

Chapter 5 synthesizes these findings into a discussion that addresses the two research questions at the thesis level, elaborating on the cross-paper contributions.

Chapter 6 concludes the thesis by summarizing the theoretical contributions, discussing practical implications, acknowledging research boundaries and delimitations, and outlining directions for future research within the broader doctoral project.

2. THEORETICAL FRAMEWORK

This chapter outlines the theoretical foundation of the thesis. The thesis draws on four distinct theoretical domains to study CLS. They serve different roles and carry different weights in the analysis. Figure 2.1 illustrates the overall theoretical approach.

The upper part of the figure shows two substantive domains for the overall thesis that provide the background and the fundamental analytical tools for the studies. The first is logistics as a service concept, which establishes what logistics contributes through its activities, structures, and actors. This domain provides the logistics utility framework, which describes how logistics creates value through form, time, place, and possession utilities.

The second is CE, which establishes the principles of resource circulation together with the supply chain concepts needed to address them, including CSC, CLSC, and RL. These concepts explain the resource flow directions in which CLS operates. This domain also provides the R-framework, a classification of circular strategies, which has been used as an analytical tool across all three studies. The thesis departs from the intersection of these two domains, where CLS is located.

The lower part of the figure shows two theoretical lenses brought to examine that intersection from different angles. Contingency theory is used to examine whether and how logistics actors align with the demands of different circular settings and serves as the foreground theory driving the analysis in Paper 2. SDL is used to examine how logistics services create value through resource integration and actor interaction and serves as the foreground theory driving the analysis in Paper 3.

The choice to work with multiple theories follows from the nature of the phenomenon itself. CLS raises questions about what logistics services consist of, who can deliver them, and how they create value. No single theory covers all three. The multi-theoretical design adopted here matches specific lenses to specific questions, grounded in a critical realist philosophical stance discussed in Chapter 3. The remainder of this chapter presents each perspective in turn, before closing with a synthesis of how they relate to each other.

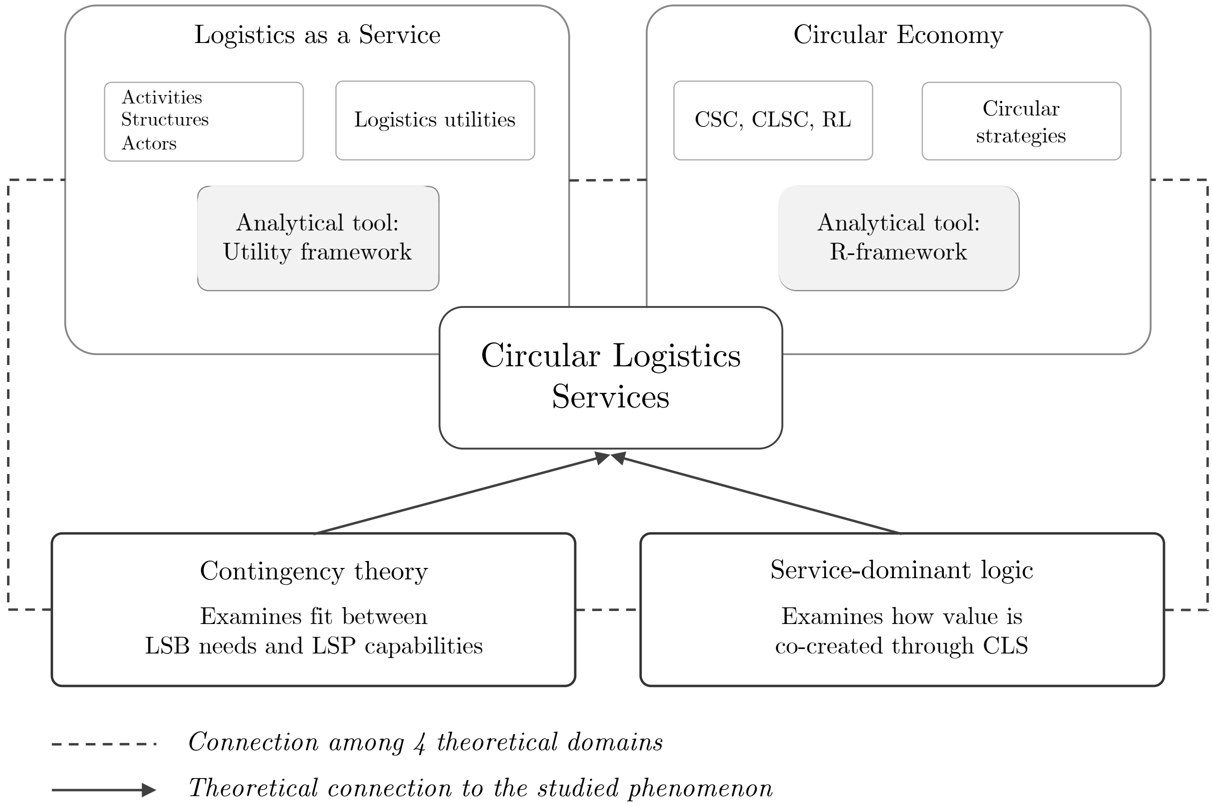

Figure 2.1: Overview of theoretical approach of the thesis

2.1. Logistics as a Service Concept

Logistics carries a dual identity. On one hand, it is an operations-heavy function concerned with the physical movement and storage of goods, measured through efficiency metrics such as fill rates, on-time delivery, and damage rates (Christopher, 2016; Mentzer et al., 1989). On the other hand, logistics has long been recognized as a service discipline, where the contribution lies not only in the goods moved but, in the ability, to satisfy the needs of those who require such services. This service dimension has been approached from multiple angles in the literature: as a utility measure (Lambert, Stock, et al., 1998), as a performance metric through dimensions such as customer service and quality (Mentzer et al., 2001), as an integrated service offering for customer service (Ellinger et al., 1997), and more recently as a mechanism to servitize supply chains (Thakur & Jena, 2024). What these perspectives share is the recognition that logistics is not restricted to goods movement; it is a service function that creates value through the coordination of activities across supply chain actors.

A distinction worth making explicit here concerns the relationship between logistics value and the actors who deliver it. The early literature on logistics utilities treats value creation as an economic function creating form, time, place, and possession value, without reference to any specific actor type (Lambert, Stock, et al., 1998). Over time, however, a parallel stream of literature emerged around the actors who turned this value creation into a core customer offering. The rise of LSP (Persson & Virum, 2001) or 3PLs (Lieb & Lieb, 2010) shifted the focus from logistics merely as an economic operation function to logistics as a service delivered by identifiable actors competing on the basis of complex service bundles (Bask et al., 2010; Prockl et al., 2012), requiring either tangible assets or knowledge-based resources (Herden, 2020), and aim to satisfy needs spanning basic transport to advanced integrated solutions (Andersson & Norrman, 2002; Hertz & Alfredsson, 2003) and service packages (Fabbe-Costes et al., 2008; Selviaridis & Spring, 2007).

The relationship between logistics and SCM further shapes how the service contribution is understood. Early SCM literature positioned logistics as part of the supporting supply chain (Lambert, Cooper, et al., 1998), a framing later extended by Carter et al., (2015), who noted that logistics actors may belong to the primary supply chain when involved in physical flows or to the support supply chain when facilitating flows without handling products directly. This dual positioning is particularly relevant in RL, where LSPs activities' extends beyond transportation to include sorting, grading, reconditioning, and coordinating (Tombido et al., 2018). Depending on where and how logistics services are provided, they create different combinations of form, possession, time, and place utilities (Lambert, Stock, et al., 1998).

The concept of logistics utilities is deeply rooted in the economics and marketing literature where they are formalized four utility types: form, place, time, and possession (Shaw, 1994). Alderson (1957, 1965) argued that consumers want neither products nor services per se but "bundles of utilities". Logistics literature adopted this framing, positioning the discipline's core contribution in the creation of time and place utility, while also contributing to form and possession utility through assembly, bundling, packaging, and delivery (Lambert, Stock, et al., 1998; Mentzer et al., 1989). The "Seven Rs," delivering the right product, in the right quantity and condition, to the right place and customer, at the right time and cost (Coyle et al., 1993), translated these utilities into a practical managerial template. Over time, the utility framework has faced criticism for being outdated, with arguments that the four categories are neither mutually exclusive nor collectively exhaustive (Shaw, 1994). However, these critiques were formulated within the logic of linear supply chains and do not necessarily hold in circular settings, where the interdependence among utilities becomes a descriptive strength rather than a conceptual weakness. The utility framework is therefore retained in this thesis not as a static typology but as an analytical foundation that is reconsidered for CE contexts.

2.2. Circular Economy

CE has emerged as a paradigm for rethinking how economic systems create, retain, and recover value, aiming to keep products, components, and materials in circulation at their highest utility for as long as possible (Geisendorf & Pietrulla, 2018; Geissdoerfer et al., 2017; Kirchherr et al., 2023). The Ellen MacArthur Foundation (2013, p. 7) defines CE as an "*industrial system that is restorative or regenerative by intention and design,*" a framing closely aligned with Geissdoerfer et al.,'s (2017, p. 766) scholarly definition of CE as a regenerative system in which resource input, waste, emissions, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. Conducting two comprehensive definition analyses, Kirchherr et al., (2017, 2023) found that while CE still lacks consensus, it evolves towards an economic system that replaces the end-of-life (EoL) concept with R-frameworks to maintain value and achieve sustainable development.

R-framework

CE principles are commonly operationalized through R-frameworks, which classify circular strategies in a hierarchical order from highest value retention to lowest: the 3R framework (reduce, reuse, recycle) is foundational (Ghisellini et al., 2016), the 4R framework adds recovery and underpins the EU Waste Framework Directive (Kirchherr et al., 2017b), while scholars have proposed up to 9R (Potting et al., 2017), 10R (Reike et al., 2018), and even 60R classifications (Uvarova et al., 2023). All variants share a hierarchy in which strategies preserving more of a product's original value are preferred over those that destroy it (Kirchherr et al., 2017; Potting et al., 2017). This thesis adopts the 9R framework (Figure 2.2), which offers the most widely used level of nuance for analytical purposes. The R framework has been applied as an analytical tool in CE research to map digital technology functions to circular strategies (Liu et al., 2022), to conceptualize disposition method in RL (Tombido et al., 2018), to classify circular value chain practices (Muller et al., 2022) and to conceptualize CE (Kirchherr et al., 2017, 2023). The R-framework is used as an analytical tool across all three studies in this thesis.

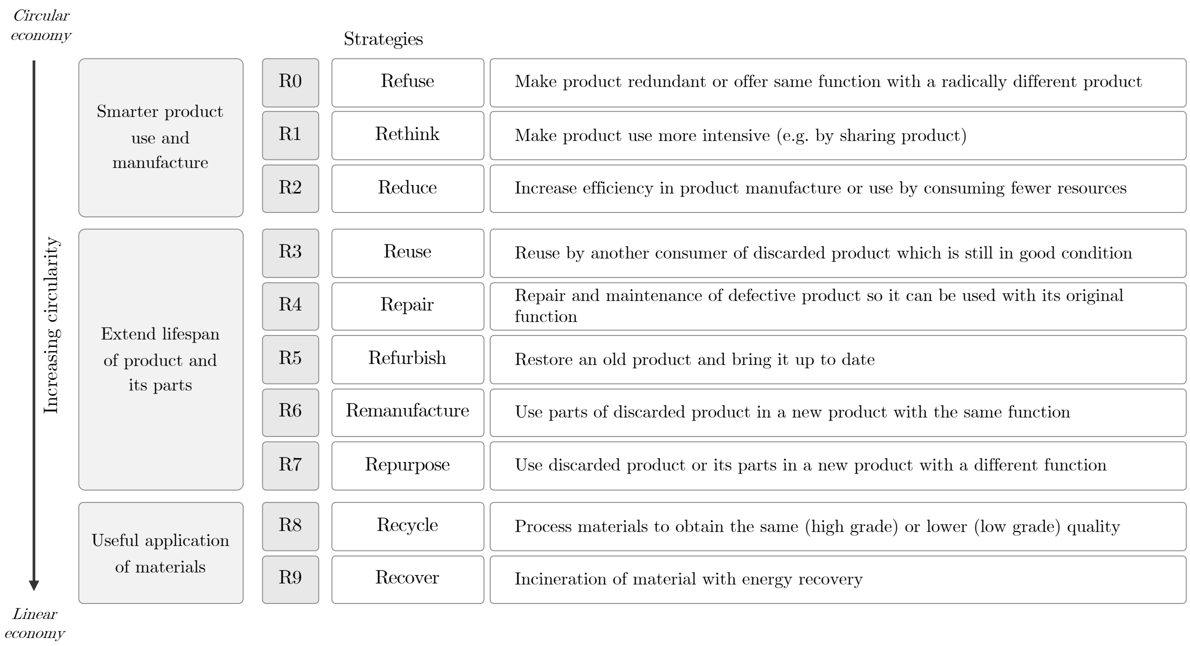

Figure 2.2: The 9R framework (adapted from Potting et al., 2017; Kirchherr et al., 2017)

Circular Supply Chain

Critically, from 2017 to 2023, the locus of this systemic change shifted from the single firm to the whole supply chain, and the emphasis on capabilities as enablers of CE gained momentum (Kirchherr et al., 2023). This thesis therefore treats CE as a system-level phenomenon (Ghisellini et al., 2016), one that requires competent supply chain structures to operationalize it and logistics service functions to make it work. One of the key concepts in this field is CLSC that integrates forward and reverse flows and shift the focus from cost efficiency to value recovery over entire product lifecycles (Govindan et al., 2015). Yet being closed structures, CLSCs remain predominantly concerned with returning goods to the original producer, neglecting the incorporation of secondary supply chains and additional supply chain actors that characterize open-loop configurations (Berlin et al., 2022).

To address this issue, the supply chain structure most closely aligned with CE principles is CSC. Batista et al., (2018b, p. 446) define CSC as the coordinated forward and reverse supply chains integrated into business ecosystems for value creation over prolonged life cycles of products, services, by-products, and useful waste flows. Farooque et al., (2019, p. 884) extend this to the *"restoration of technical materials and regeneration of biological materials toward a zero-waste vision involving all stakeholders in a product/service lifecycle including parts/product manufacturers, service providers, consumers, and users."* Two features of the CSC concept are particularly important for this thesis. First, by expanding the scope to all supply chain activities from product design to end-of-life management, the CSC concept positions the traditional linear supply chain as only one part of a larger circular system, introducing the restorative and regenerative vision to the original conceptualizations of SCM (Lambert & Cooper, 2000). Second, and crucially, Farooque et al.,'s (2019) definition explicitly includes service providers as stakeholders. This inclusion underlines that circular flows do not organize themselves; they require coordinated logistics services spanning collection, sorting, redistribution, and material processing across multiple actors and chains. The complexity of these CSC operations is further reflected in the logistics activities required to integrate them: reverse-flow coordination, material processing, service logistics, and platform coordination emerge as distinct needs when circularity involves multiple actors whose actions must be synchronized (Mate et al., 2026). Drawing on the fundamentals of contingency theory that there is no single optimal way to organize (Donaldson, 2001; discussed further in Section 2.5), this thesis argues that because logistics service designs are tightly coupled to supply chain strategies, the needs they address change with a company's circular orientation and no single logistics configuration satisfies all circular demands.

Reverse Logistics

RL has evolved through four decades of scholarly work. Lambert and Stock (1981, p. 19) described it as *"going the wrong way on a one-way street"*, locating RL within the reverse direction of a forward-oriented channel. Stock (1998) broadened its activity scope to include returns, recycling, reuse, remanufacturing, and disposal. Rogers and Tibben-Lembke (1999, p. 2) consolidated this trajectory into one of the most cited RL definitions in past decades: "*the process of planning, implementing, and controlling the efficient, cost effective flow... from the point of consumption to the point of origin for the purpose of recapturing or creating value or proper disposal"*. However during that time period RL emerged as a return management strategy to deal with unsold, defected and returned products driven by cost recovery and regulatory pressure on landfilling (Rogers & Tibben-Lembke, 2001).

As CE gained traction, RL was applied across remanufacturing (Dowlatshahi, 2005), waste from electrical and electronic recovery (das Neves Silva et al., 2023; Pan et al., 2022), construction (Ding et al., 2023; Pushpamali et al., 2019), healthcare waste (Budak & Ustundag, 2017; Wang et al., 2021), plastics (Khan et al., 2020; Tesfaye & Kitaw, 2021), food waste (Viscardi et al., 2023), and textiles (Saccani et al., 2023; Sumo et al., 2023). Bai and Sarkis (2013, p. 307) noted that *"not all RL functions will be similar and generic"* and that availability depends on *"the product life cycle, industry, and design of the RL network."* Recent work has pushed RL further toward CE. Agrawal et al. (2015, p. 76) defined it through the sequence of activities to collect used products for recovery or disposal. Paula et al. (2020) argued RL should cover the full product lifecycle including design. Ding et al. (2023, p. 11) coined the new term "Circular Logistics Integration" as planned coordination between forward and RL actors. Mallick et al. (2024) developed a configurational tool for designing RL systems across collection, recovery routes, partnerships, and governance.

Even in its expanded form, RL rests on four assumptions that define what it can conceptually cover.

- *A single reverse direction*: RL is defined against forward logistics, and the reverse direction remains the fundamental distinction even when integration with forward flows is theorized
- *Disposition decision prior to logistics acts*: the decision to reuse, repair, refurbish, remanufacture, recycle, or dispose precedes the logistics activity, which then executes that decision (Melo et al., 2022; Thierry et al., 1995).
- *A single-firm perspective*: RL is theorized from the viewpoint of a focal firm that owns or contracts the return, and third-party involvement is treated as outsourcing rather than as coordination among independent actors.
- *A predetermined value category*: RL moves material toward a fixed destination (recovery or disposal) (Butt et al., 2024; Melo et al., 2022) whose value status is decided before the logistics activity begins.

What has changed across four decades is the surface scope: more activities, sectors, and actors have been analyzed, while the four underlying assumptions have remained largely intact. One reason is that RL literature has developed primarily to serve CLSC structures rather than CSCs. Scholars within the CSC research field have acknowledged the limits. Batista et al. (2018a, p. 111) argued the "*reverse logistics narrative is insufficient*" for CE because restorative loops may not involve returns to the focal firm and may instead comprise open-loop or cross-chain flows. Sehnem et al. (2019) positioned RL as the innermost concept in a nested hierarchy that CE subsumes. Martins et al. (2022) found the circular aspect is missing from RL's sustainability framing. These recognitions identify insufficiency but do not specify the alternative commitments logistics in CE requires. RL remains foundational, but the multi-directional, multi-actor, multi-lifecycle nature of CE calls for a service construct that does not rest on these four assumptions. Appendix 1 provides a comprehensive overview of RL definitions.

2.3. Service Dominant Logic

Value in traditional logistics literature is understood in terms of delivering the right product to the right place at the right time (Lambert, Stock, et al., 1998). In CE, however, this understanding becomes insufficient. Materials are not consumed only once but circulate across multiple use cycles, often through actors who were not part of the original transaction. Value is therefore not simply transferred, but also retained, recovered, and in some cases recreated through activities such as sorting, reconditioning, and redistribution. As the same material moves through multiple actors and use cycles, the questions of who creates value, where it resides, and how it is realized become more complex. Since this thesis adopts a service perspective on logistics, SDL provides a suitable theoretical foundation for addressing this complexity.

SDL, introduced by Vargo and Lusch (2004) and refined through successive foundational premises (Vargo & Lusch, 2006, 2008, 2016) is a meta-theoretical framework that reconceptualizes economic exchange as fundamentally based on service, defined as the application of competences for the benefit of another (Nariswari & Vargo, 2024). SDL departs from the traditional goods-dominant logic in which value is embedded in tangible outputs and transferred at the point of sale. Instead, it proposes that value is always co-created through the reciprocal integration of resources among multiple actors and is uniquely determined by the beneficiary in context (Vargo & Lusch, 2016). This distinction infers that the LSPs in circular settings does not "add" value to circulated materials per se but facilitates conditions and contexts under which beneficiaries (LSBs) can realize value from recovered resources.

SDL is employed in this thesis, specifically in Paper 3, as the analytical lens for examining how logistics services are configured to co-create value in circular settings.

Table 2.1: Service Dominant Logic: Foundational premises (Vargo & Lusch, 2016)

Foundational premise (FP)	Axiom status	Description
FP1	Axiom status	Service is the fundamental basis of exchange
FP2		Indirect exchange masks the fundamental basis of exchange.
FP3		Goods are distribution mechanisms for service provision.
FP4		Operant resources are the fundamental source of strategic benefit.
FP5		All economies are service economies.
FP6	Axiom status	Value is cocreated by multiple actors, always including the beneficiary.

FP7		Actors cannot deliver value but can participate in the creation and offering of value propositions.
FP8		A service-centered view is inherently beneficiary oriented and relational.
FP9	Axiom status	All social and economic actors are resource integrators.
FP10	Axiom status	Value is always uniquely and phenomenologically determined by the beneficiary.
FP11	Axiom status	Value cocreation is coordinated through actor-generated institutions and institutional arrangements.

Three features make it suited for this purpose. First, SDL foregrounds service rather than physical goods as the basis of exchange (FP1), allowing logistics to be understood as the application of specialized knowledge and capabilities, termed operant resources (FP4), rather than merely the movement of objects. Second, its distinction between operant resources (knowledge, skills, governance routines) and operand resources (physical assets, infrastructure) and the way they combine in the CE context, provides an interface with logistics utilities concept to explain value creation in CLS configurations. Third, SDL's multi-actor, institutional, and phenomenological conception of value (FP6, FP10, FP11) addresses the complexity of circular material loops, where value is co-created across networks and no single actor controls the outcome. A particularly productive tension arises at the intersection of SDL and CE: FP10 asserts that value is always phenomenologically determined by the beneficiary, while CE from value recovery perspective, treats value as objective and resource oriented (e.g., maximizing material recovery, extending product lifespans, closing loops) (Geissdoerfer et al., 2017; Ellen MacArthur Foundation, 2013). Paper 3 addresses this through a dual value logic, where the design of a circular configuration is oriented toward resource retention, but the realization of that value remains phenomenological and context dependent.

2.4. Contingency Theory

The previous section addressed how value is created through service exchange in circular settings. Drawing from that it is crucial to understand whether the actors involved are well positioned to deliver output on that exchange. CE demands logistics capabilities that vary across sectors and circular strategies, and not all actors may possess what is needed. Whether a given actor configuration works depends on the specific setting: the material type, the recovery strategy, the regulatory context, and the actors involved. This is fundamentally a question of fit between what LSBs need in their circular transitions and what LSPs can offer. Contingency theory provides the analytical lens to examine this fit.

Contingency theory suggests that there is no single optimal way to organize or manage business processes; rather, effectiveness depends on the degree of fit between an organization's internal characteristics and its external conditions (Donaldson, 2001; Lawrence & Lorsch, 1986). This premise aligns directly with the context-dependent nature of CE, where empirical research shows that circular transitions are highly sector-specific and cannot be universally replicated (Aminoff & Sundqvist-Andberg, 2021; Hazen et al., 2020). In SCM and operations management research, contingency theory has been widely applied to explain how structures, processes, and management practices should vary across different environments and strategies, typically examining how contextual variables shape adoption, implementation, and performance outcomes (see, e.g., Flynn et al., 2010; Selensky, 2022; Sousa & Voss, 2008).

Early contingency-based logistics research was primarily concerned with how contextual factors (environmental complexity and dynamics, product and market homogeneity, production technology, organizational size, and interdependencies across units) shape the internal organization of logistics task (Pfohl & Zöllner, 1997). However, these contextual factors are not similar to the contingency conditions in CE-specific requirements, such as circular material flows, life-extension activities, material recovery, traceability, and circular know-how. In this way, contingency theory is adapted to CLS by showing that the key issue is not only how logistics is organized internally, but also whether provider capabilities and service configurations are aligned with the buyer's circular requirements.

In this thesis, contingency theory is applied in Paper 2 to examine the fit between LSBs and LSPs in CE settings. The concept of fit has been viewed as an internal consistency among key strategic decisions or the alignment between strategic choices and critical contingencies with the environment (external), organization (internal), or both (external and internal) (Ensign, 2001). Although the central construct is *fit*, there is no common understanding and agreement about the theoretical meaning of fit as it is conceptualized and operationalized in multiple ways in different research streams (Turkulainen, 2022). One of the highly regarded conceptualization of fit is by Drazin and Van de Ven (1985), who suggested three forms of fit: fit as selection (congruence between context and structure), fit as interaction (interplay between organizational contexts and structural factors), and fit as systems (internal consistency that affects performance). From the operations management and SCM research field, Sousa and Voss (2008) suggested three types of variables: contextual or contingency variables; response variables; performance variables align closely in terms of underlying meaning with Drazin and Van de Ven (1985)'s fit conceptualization (Table 2.2). This thesis thus draws from the above mentioned fit conceptualization and operationalizes fit across three complementary layers: strategic fit (congruence between a company's overall circular orientation and its external context), functional fit (alignment of supply chain structures and logistics processes with external contingencies), and capability fit (coherence among circular capabilities and resources that jointly enable effective circular flows) (Table 2.2). These three layers jointly explain how LSP offerings can or cannot effectively respond to heterogeneous CE-driven needs from LSBs, confirming that fit varies systematically across sectors depending on how well LSP strategies, functions, and capabilities match the LSB's CE context. Contingency theory is thus positioned in this thesis as a theoretical lens to examine the relational aspect, meaning specific explanatory work on the fit between actors within the studied phenomenon.

Table 2.2: Derivation of Strategic, Functional and Capability Fit

Alternative forms of fit (Drazin & Van de Ven, 1985)	**3 types of variables (Sousa & Voss, 2008)**	**Conceptualization of fit in the thesis**
Fit as selection: fit is assumed premise underlying a congruence between context and the structure	**Contextual or contingency variables:** Reflect strategic goals and environmental conditions	**Strategic Fit:** congruence between the company's overall circular orientation and its external context
Fit as interaction: fit is interaction of organizational contexts and structure factors	**Response variables:** organizational or managerial actions taken in response to current or anticipated contingency factors	**Functional Fit:** capturing how company's SC structures and logistics processes align with external contingencies
Fit as systems: internal consistency that affects performance	**Performance variables:** effectiveness outcomes used to evaluate whether the responses fit the context.	**Capability Fit:** emphasizing the coherence among circular capabilities and resources that jointly enable effective circular flows

2.5. Synthesis

Theory, at its core, provides answers to questions of what a phenomenon consists of, how it works, and why it behaves as it does (Sutton & Staw, 1995; Whetten, 1989). However, not all theorizing serves the same purpose nor takes the same form. Sandberg & Alvesson (2021) identify five theorizing types (explaining, comprehending, ordering, enacting, and provoking) while noting that these are not entirely discrete, as each contains aspects of the others. Similarly, Cornelissen et al., (2021) distinguish three knowledge interests (explanatory, interpretive, and emancipatory) but advise against treating them as rigid models. Drawing from these ideas, this thesis does not limit itself to a specific theorizing style, although the influence of the above perspectives is present throughout. Instead, following Pflueger et al., (2024), the view adopted here is that of theory as both a "camera" that describes and explains reality (the fit between actors, utility transformation), and an "engine" that through conceptualization can reshape how a phenomenon is understood and organized (CLS as a distinct logistics service phenomenon).

Logistics as a service concept establishes that the value contribution of logistics lies in the creation of form, time, place, and possession utilities (Lambert, Stock, et al., 1998). In linear settings, time and place utilities are the core logistics utilities. CE, however, introduces circular strategies classified through the R-framework (Potting et al., 2017; Reike et al., 2018), each of which generates different demands on logistics. Strategies such as repair and refurbishment require sorting, grading, and reconditioning, activities that fall under form utility. Higher-order strategies such as reuse and sharing shift the emphasis toward possession utility. The R-framework thus connects CE strategies to logistics utilities by specifying what kind of logistics work each circular strategy requires. CSC, CLSC, and RL describe the supply chain and logistics structures through which these strategies are facilitated.

This changed utility aspect of logistics in CE naturally raises the question of fit between LSBs and LSPs. Different R-strategies, in different sectors, produce different logistics needs and whether existing providers can meet those needs becomes critical for effective CE transition. Contingency theory allows this to be examined by assessing the fit at strategic, functional, and capability levels, and by identifying where and why gaps exist between what services are needed and what are available.

Value is one of key principles in both in CE and logistics service literature. The fit between actors, however, does not by itself explain how value is created in CE. Two actors may be well aligned in terms of capabilities, yet the value creation depends on how their resources are integrated and what institutions enable or constrain their interactions. SDL addresses this by explaining value as something that is co-created through resource integration among actors and specialized knowledge (Vargo & Lusch, 2016). Thus, the logistics utility concept shaped by the R-framework and other CE principles, connects the fit question to the value question: utilities describe what logistics functionally contributes in a given circular setting, while SDL explains how those contributions become value through actor interaction. Together, these perspectives form the theoretical foundation for studying CLS. Figure 2.1 visualizes these relationships in the beginning of the chapter. The detailed theoretical contribution that emerges from their combined application is developed in Chapter 6.

3. METHODOLOGY

The theoretical foundation established in Chapter 2 brings together multiple theoretical perspectives to examine CLS. Each perspective calls for a different form of empirical engagement, and the methods used in this thesis follow from those theoretical perspectives. However, the research process was not strictly sequential; theory and empirical work developed iteratively, with each study informing the direction of the next. The multi-theoretical and multi-method approach is guided by the ontological and epistemological stances which further explain how the theories and methods deployed in this thesis are complementary rather than conflicting. This chapter describes the research philosophy (Section 3.1), the research process (Section 3.2), the methodological choices for each study (Section 3.3), and a reflection on the overall approach including its justifications and limitations (Section 3.4).

3.1. Research Philosophy

SCM is a broad interdisciplinary research field that lacks a grand theoretical basis and is, to a significant degree, context-dependent; conducting research in the field therefore requires considering both object-specific and context-specific factors within a fragmented theoretical landscape (Eriksson & Engström, 2021). This view is shared by Halldórsson et al., (2007), who argued that there is no unified theory of SCM, and that researchers must choose a dominant explanatory theory for a given situation and complement it with other theoretical perspectives as needed. The implication is that the field's complexity cannot be addressed through a single theoretical lens; instead, researchers must work across a diverse landscape, adapting to the demands of different research problems. To synthesize, it becomes important for researchers to reflect on their methodology, data collection techniques, theory orientation, and analysis procedures, that is, on what counts as knowledge in a given field and how that knowledge is created (Danermark et al., 2019). These questions belong to the domains of ontology and epistemology (Bell et al., 2019), which are addressed here under the heading of research philosophy. Early research in logistics is rooted in positivism where reality is considered to be objective, tangible, and fragmentable and can be explained and predicted (Mentzer & Kahn, 1995). However this positioning has been argue that this assumption is a misconception rooted in the discipline's early history and is a myth (Aastrup & Halldórsson, 2008). Thus, establishing a definitive philosophical stance within SCM and logistics research is complex; nevertheless, it is essential to articulate the multi-theoretical and multi-method framework adopted in this thesis.

The context-dependent and object-specific nature of logistics research, led this thesis to adopt critical realism (CR) as its philosophical stance, a position developed in the 1970's that combines ontological realism with epistemological relativism (Bhaskar, 1997). CR holds that reality exists independently of our knowledge of it (Bhaskar, 1997), but that our access to that reality is always conceptually mediated and fallible (Danermark et al., 2002; Sayer, 1992). Central to CR is a stratified ontology comprising three domains: the *real*, containing structures and mechanisms with causal powers; the *actual*, including events generated by those mechanisms whether observed or not; and the *empirical*, encompassing what is experienced or measured (Bhaskar, 2008; Danermark et al., 2002). In CR causality is not a set of predictable laws but a multi-level interaction of mechanisms that create "tendencies" toward certain events. This perspective shifts the focus from universal patterns to understanding how complex structural connections produce specific, emergent outcomes within a changing society (Alvesson & Sköldberg, 2009). Thus CR is argued to be particularly well suited for interdisciplinary research (Danermark et al., 2002).

CR is adopted here for two reasons. First, CLS involve real structures, such as supply chain configurations, logistics networks, and actor relationships, that exist independently of whether researchers have conceptualized them. However, CLS varies across industries, actors, and business contexts, meaning that our knowledge of these structures is always partial and shaped by the empirical access available in a given setting (Sayer, 2000). CR accommodates both conditions: it affirms that there are real mechanisms to be discovered while recognizing that any account of them is fallible and open to revision (Bhaskar, 1975). Second, CR's stratified ontology justifies the multi-theoretical and multi method design of this thesis (Easton, 2010). Because reality is layered, different lenses can illuminate different mechanisms within the same phenomenon (Danermark et al., 2002). Based on the CE and logistics service concepts an SLR accesses the conceptual landscape through published knowledge (Paper 1). Contingency theory accesses mechanisms of organizational alignment through content analysis of structured corporate reporting (Paper 2), while SDL accesses mechanisms of value creation through semi-structured interviews (Paper 3). Under CR, these are complementary lenses at different strata, consistent with Bhaskar and Danermark's (2006) argument that complex phenomena require a laminated understanding.

One of focal concept of CR is retroductive reasoning: the inference from observed patterns to the generative mechanisms that produce them (Danermark et al., 2002). At this licentiate level, there is an inherent tension between the transformative goals of CR and the current empirical scope. Due to the limited primary data, the analysis remains largely at the level of the "observed," falling short of a comprehensive retroduction into underlying causal mechanisms. However, this philosophical positioning is intentional, providing the necessary conceptual framework for the more intensive empirical inquiry planned for the Doctoral thesis.

3.2. Research Process

This doctoral research began in October 2023 as part of the CIRCLOG project. Coming from a service management and SCM background, concepts such as RL and sustainable SCM were familiar to me. However, the specific framing of "circular logistics" as a research domain was new, and the early months were oriented toward building an understanding of both the empirical landscape and the academic literature simultaneously.

This dual orientation shaped the trajectory of the research. On one side, corporate reports from various companies were examined to map current circular practices and service offerings. On the other, a systematic review of the academic literature was initiated to clarify the conceptual boundaries of the domain. These two activities developed in parallel rather than in sequence, and the initial drafts of Papers 1 and 2 emerged from this concurrent engagement with practice and literature. An early version of Paper 2, presented at the EurOMA Sustainability Forum in 2024, was primarily a descriptive mapping of companies and their circular practices without a theoretical framework. The first draft of Paper 1 was presented at NOFOMA 2024, where the systematic review provided the conceptual grounding that, in turn, reshaped Paper 2. The need for a structured theoretical lens to explain how logistics needs and offerings align in circular settings, what became the contingency theory framing, developed through many scholarly discussions and presentations in various conferences, seminars and doctoral courseworks.

The research process thus followed the logic of systematic combining (Dubois & Gadde, 2002), characterized by iterative movement between empirical observations, theoretical frameworks, and research design. Rather than proceeding linearly from theory to data, each study informed the others: the conceptual clarity gained from the SLR structured the analytical framework for Paper 2, while the empirical breadth of the corporate report analysis informed the sampling strategy and interview guide for Paper 3. The process also included revisions prompted by external feedback from the journal reviewers. Paper 1 was submitted to a journal in early 2025; the extensive reviewer comments, led to substantive improvements. The revised version was resubmitted to another journal and is currently under revision. Paper 2, enriched by PhD coursework on analytical lenses and by the addition of a new actor group requiring re-coding of the latest corporate report dataset, was submitted in early 2026 and is also under review.

Throughout this process, a recurring observation across both the literature and the corporate data pointed toward a gap: how value is created through logistics in circular settings. This question could not be addressed through academic literature or corporate reports alone; it required practitioners' experiential knowledge of real-world value creation processes. Paper 3 was thus initiated, drawing on semi-structured interviews complemented by insights from the preceding two studies. The full paper has been submitted to NOFOMA 2026. Figure 3.1 illustrates the progression of this research process and the iterative relationships between the three studies.

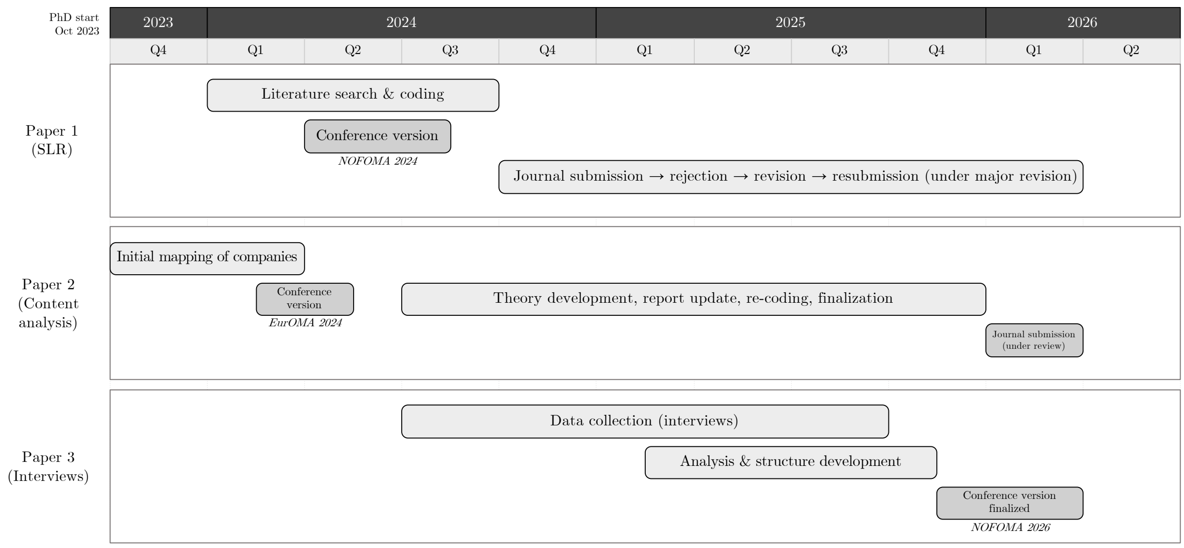

Figure 3.1: Research process and study progression

3.3. Methodological Choices for Individual Studies

3.3.1. Study 1

Paper 1 addresses the fundamental conceptual question "what CLS is", through a systematic literature review (SLR). The choice of an SLR was motivated by the need to compare existing terminologies and synthesize a fragmented body of knowledge spanning logistics, SCM, and CE into a coherent conceptualization. When the aim is to investigate the understanding of a concept, written definitions offer a more deliberate and comparable basis than ad hoc responses from interviews, as the former tend to reflect more carefully considered positions (Dahlsrud, 2008; Kirchherr et al., 2017). An SLR was therefore the appropriate method for establishing the conceptual foundation on which the subsequent studies build.

The review followed the SCM-specific SLR protocol developed by Durach et al. (2017). Two search strings were developed to capture the intersection of CE and logistics domains, including subdomains such as CLSC, CSC, RL, and R-framework activities (Table 3.1). Searches were conducted in Scopus and Web of Science, covering the period 1980–2024. The starting year was determined through a preliminary search of the RL literature, which identified the earliest academic contributions to the domain in the early 1980s (Prajapati et al., 2019), ensuring that the review captured the full trajectory of conceptual development from RL through CLSC to CSC. After removing duplicates, a baseline sample of 4,561 articles was reduced to 2,432 after excluding irrelevant fields. Sequential screening by two researchers using predefined inclusion and exclusion criteria, yielded a final sample of 273 articles including 18 additional articles from snowballing.

The analysis adopted an inductive theory-building approach combined with contextualized explanation (Durach et al., 2021). Attribute coding was used for descriptive analysis, while provisional coding (Miles et al., 2014) supported the abductive identification of the building blocks of CLS: bundled logistics activities, logistics structures, and actor categories. The coding structure was developed independently by two researchers and refined through iterative discussion, consistent with established practices in logistics research (Seuring & Gold, 2012) (See appended paper 1 for coding examples).

Table 3.1: Search string development

Search String	Main Field of Study	("Supply chain management" or "logistics")
		And
	CE activities	("remanufacture" or "refuse" or "rethink" or "reduce" or "reuse" or "repair" or "refurbish" or "repurpose" or "recycle" or "recover" or "waste" or "regenerate" or "restore")
		Or
	Related research field	("CE" or "reverse logistics" or "circular supply chain" or closed-loop supply chain" or "closed loop supply chain" "reverse supply chain" or "circular business models")
Inclusion criteria	Study Focus	Focus on supply chain and logistics activities in the light of CE
	Time Range	(1980-2024)
	Language	English
	Type of article	Peer-reviewed journal articles and book chapters.

3.3.2. Study 2

Paper 2 addresses the fit between the LSBs and the LSPs, through qualitative content analysis of corporate reports. Content analysis was chosen because the context-dependent nature of circular strategies across sectors (Furtado et al., 2024) makes accumulating comparable empirical evidence through interviews challenging; inconsistent use of CE taxonomies across respondents reduces comparability, whereas corporate reports offer a more systematic and structured basis for assessing current practices (Esposito et al., 2023; Opferkuch et al., 2021). Content analysis is widely applied in corporate sustainability and corporate social responsibility (CSR) research (Landrum & Ohsowski, 2018). Furthermore, CSR reports serve as primary channels for communicating sustainability strategies to stakeholders (Stewart & Niero, 2018) and are recognized as reliable secondary data sources in CE research (Esposito et al., 2023; Opferkuch et al., 2021; Stewart & Niero, 2018) and SCM and logistics studies

(Jayarathna et al., 2021; Mir et al., 2018; Turker & Altuntas, 2014). This choice of using corporate reports, also connects to the practice-grounded orientation established in the corporate reports represent how organizations themselves articulate their circular commitments and logistics capabilities according to regulatory requirements (especially EU and UN directives), making them a form of organizational document that reflects the official view of senior management (Bell et al., 2019).

The empirical material comprised corporate reports sampled across six sectors using the Circularity Gap Report Sweden (2022). To justify the sector scope, this study follows the Circularity Gap Report Sweden (2022), which focuses on six leverage areas in the Swedish economy: (1) built environment, (2) food system, (3) manufacturing, (4) extractive industries, (5) mobility, and (6) consumables. These sectors were selected using the Mass–Carbon–Value nexus, combining consumption-based material footprint (Mass), consumption-based GHG emissions (Carbon), and production-based gross value added (Value) to identify where circular interventions can deliver the greatest impact (Circularity Gap Report Sweden, 2022).

These chosen sectors align with the research purpose since they can be categorized in LSPs and LSBs. The mobility sector was included to represent both freight and passenger mobility in the circularity gap report. Here, only freight mobility (F1) was included to represent the LSP side of the data set in the beginning. Later the authors found that waste management companies (WMGT) are also providing logistics services that highly relate to the LSBs' circularity agenda. Hence this subcategory (F2) was added later in the iterative research process. The remaining sectors represent the LSBs. To enable comparative analysis, five companies were selected from each sector (Table I). The majority of the companies are founded in Sweden; a few are large multinational companies with big presence in Sweden. Company size was the primary criterion in choosing them. 45 large companies were sampled using the European Commission's (2021) definition of a large company. Micro, small, and medium companies were excluded due to limited publicly available data.

The analysis combined deductive category building with iterative inductive refinement (Seuring & Gold, 2012). In the first phase, coding was conducted at the company level. This included logistics services (Larson & Halldorsson, 2004), circular strategies based on the 9R framework (Reike et al., 2018), and the three fit dimensions derived from contingency theory: strategic, functional, and capability fit (Table 2.3). This coding phase also covered practices such as collaboration and integration, tangible and intangible resources including infrastructure, networks, and expertise, and how digital technologies and data enable these elements. This deductive coding scheme was applied to both LSBs and LSPs.

In the second phase, the company-level codes were synthesized into sector-level theoretical categories through inductive generalization. Throughout the analysis, LSB practices were interpreted through circular orientation at the strategic level, organizational logistics processes at the functional level, and circular capabilities and resources at the capability level. Together, these indicated their CE-related logistics needs. LSP practices were examined through the same three-level lens. Finally, the LSB and LSP categories were cross-matched across all three fit levels to assess alignment (see Paper 2, Figure 2 and the appendices).

The quality of corporate reports as a data source was assessed using Scott's (2014) four criteria for document analysis. Authenticity was ensured by sourcing reports exclusively from official corporate channels and verified public databases. Credibility was strengthened by the regulatory context in which these reports are produced: the EU Non-Financial Reporting Directive mandates disclosure from large public-interest companies (European Union, 2014), and alignment with established frameworks including the UN Sustainable Development Goals, the Global Reporting Initiative (GRI), and Integrated Reporting enhances consistency and reduces ambiguity in CE terminology (Esposito et al., 2023; Opferkuch et al., 2021). Representativeness was addressed through the sampling strategy, which covered 45 large Swedish companies across six sectors, selected using the Circularity Gap Report Sweden (2022) and the European Commission's (2003) definition of a large company. Meaning was addressed through the coding procedure, which applied predefined analytical categories drawn from the theoretical framework rather than relying on the language of the reports at face value.

A known limitation of corporate reporting is that it may contain promotional content that overstates actual practice (Bell et al., 2019). To mitigate this risk, two measures were taken. First, the analysis focused on specific, verifiable statements about logistics activities, circular strategies, and capabilities rather than on general sustainability claims or aspirational language. Second, corporate websites were used as a complementary data source, particularly for LSPs where circular offerings maybe emphasized unevenly in annual reports (Adams & Frost, 2006). A second round of data collection using 2024 reports was conducted to capture evolving sector developments and to cross-check patterns identified in the initial 2022 dataset.

Table 3.2: Sectors and corresponding companies

No	Actor type	Sector	Code	Company configurations	Company
1	LSBs	Agro & food	A	Agro and food products	AXFOOD
					ICA GROUP
					Arla Foods
					Lantmännen
					Orkla
2		Mining and extraction	B	Mining, extraction, and biomass	Sandvik
					Vattenfall
					Boliden AB
					LKAB
					Epiroc
3		Manufacturing	C	Steel, Automotive, Chemical, industry	SSAB
					Volvo Cars
					SKF

				machinery, food processing equipment	Astrazeneca
					Getinge
4		Construction	D	Real estate	Skanska AB
					Peab AB
					NCC AB
					JM AB
					BDX
5		Consumables	E1	Textiles	H&M
					Kappahl
					Nakd
					Lindex
					Gina Tricot
			E2	Furniture	Ikea
					Nobia AB
					MIO
					Kinnarps
					Svedbergs Group
			E3	Small equipment (Appliances and machinery)	Electrolux group
					Clas Ohlson
					Kjell group AB
					Elon Group
					Komplett group
6	LSPs	Mobility	F1	Freight transport	DB SCHENKER
					DHL Freight AB
					DSV
					CEVA
					Kuehne + Nagel International AG
			F2	Waste Management Companies	Stena Recycling
					Ragn-Sells
					Sortera
					NSR
					Pre-zero

3.3.3. Study 3

Paper 3 addresses the value aspect of how CLS creates value. An exploratory qualitative design (Corbin & Strauss, 2015) was adopted because the phenomenon under investigation, value creation through logistics services in circular settings, is relational, context-dependent, and theoretically nascent; no established framework explains the logistics–service–value connection in CE. Unlike the first two studies, which drew on written sources, this study required direct engagement with practitioners whose experiential knowledge could reveal the service configurations and value logics that documents cannot capture. Thus, the chosen method for this study was semi-structured interviews.

For the interviews, initial interviewees were identified through existing research networks. Although this sampling method might be termed as a convenience sampling, and be criticized for "*neither strategic nor purposeful*" (Patton, 2015, p. 467), however these organizations were not just simply chosen due to ease of access alone. These organizations were part of the research project specifically due to their CE initiatives and logistics specialty. Succeeding interviewees were identified through purposive sampling (Flick, 2014; Patton, 2015), guided by two criteria: active involvement in logistics activities supporting CE initiatives, and maximum variation in industry context, actor role, and circular strategy. The resulting sample of 15 organizations spans second-hand textiles, consumer electronics, construction, furniture, EV batteries, packaging, logistics technology, recycling, and municipal waste management (Table 3.3).

The sample size was determined by the study's unit of analysis, which is the service configuration rather than the sector. The objective was not to achieve saturation within individual industries but to identify recurring patterns in how logistics services are configured to create value across circular settings. By the fifteenth interview, the core patterns relevant to this purpose were appearing repeatedly in the later interviews. At the same time, the decision to stop at 15 interviews should not be understood as a claim that no further insights could emerge from additional data. Rather, based on the focused research aim, the specificity of the sample, most of whom held top management roles, and the use of SDL and logistics utility concepts as guiding theoretical lenses, the material was assessed to provide sufficient information power for the configurational analysis (Malterud et al., 2016).

The interviews lasted between 45 and 90 minutes and were transcribed verbatim. The interview guide was structured around three thematic areas: context and role, service offerings, and interactions and resource integration. Secondary data from company websites and sustainability reports provided contextual background.

Data analysis followed three phases following the Gioia methodology (Gioia et al., 2013) (See Paper 3, Appendix 2). First-order coding captured empirical observations in respondents' own language. Second-order theme construction grouped these codes through iterative dialogue with the paper's theoretical framework, while permitting emergent constructs where the data justified departure from the initial framework. In the final phase, coded material was compared across organizations to identify recurrent patterns in CLS service configurations explaining how value is created through logistics services in CE.

Table 3.3: Overview of interviewed organizations

#	Interviewee Code	Interviewee Designation	Industry	Data collection method
1	TEX1	General Secretary	Second-hand Textile	Interview, workshop and site visit
2	TECH1	Founder	Logistics Technology	Interview
3	MUN1	Strategist	Waste Handling + Municipality	Interview
4	LSP1	Circular logistics project leader	Logistics	Interview
5	PCK1	Founder &CEO	Packaging	Interview and workshop
6	ELC1	Sustainability Manager	Consumer Electronics	Interview
7	CON1	Project Manager	Construction	Interview
8	TEX2	Circular Product Manager	Textile	Interview
9	REC1	Innovation Manager	Recycling	Interview
10	BSP1	CEO	Electric Vehicle battery	Interview
11	BSP2	Managing Director	Electric Vehicle battery	Interview
12	FUR1	Corporate Sus Manager	Furniture	Interview
13	TEX3	Founder	Textile	Interview
14	TEX4	Founder	Textile	Interview
15	TEX5	Founder	Textile	Interview

3.4. Methodological Reflection

This thesis adopts a qualitative research design across all three studies (Figure 3.2). Each study calls for interpretation, categorization, and conceptual development which positions the thesis within a qualitative logic of inquiry (Corbin & Strauss, 2015; Flick, 2014). The three methods were not selected in isolation from each other. Conceptualizing CLS required synthesis of written academic definitions where deliberation and comparability are priorities. Assessing buyer–provider fit required structured comparison of how organizations report their circular commitments across sectors. Investigating value creation required practitioners' experiential accounts that neither academic literature nor corporate reports can access. The studies do not cross-validate the same finding from different angles; they address different questions about the same phenomenon, and their contribution lies in how each enriches the others. The SLR provided the conceptual vocabulary that shaped the analytical framework for the content analysis and the interview guide for the empirical study. The content analysis revealed the Swedish industry landscape and defined the contextual background which assisted to selected interview respondents for the third study.

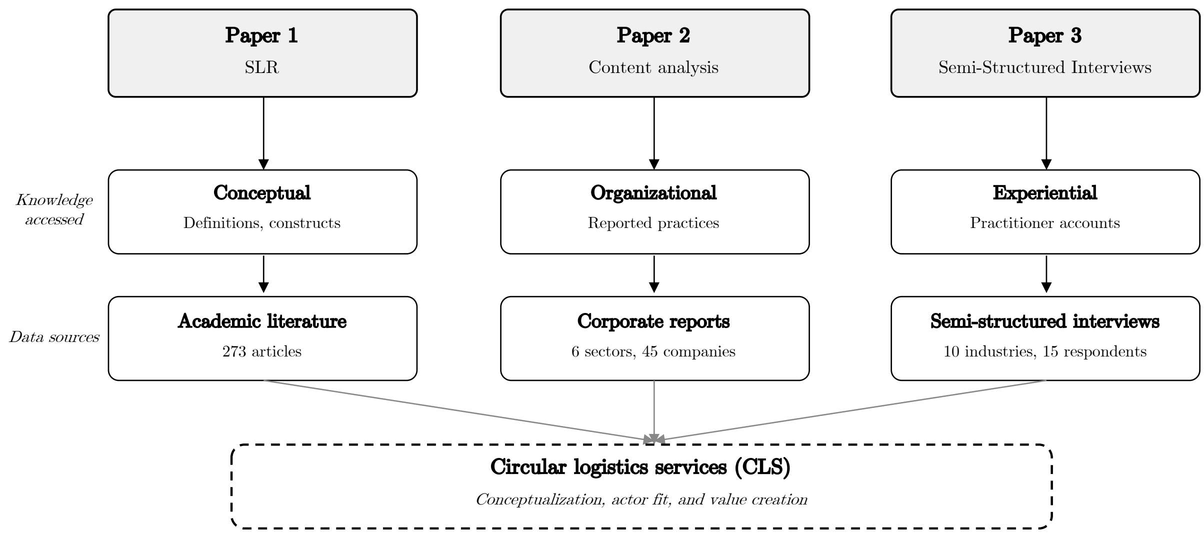

Figure 3.2: Multi-method research design

3.4.1. Alternative method consideration

Methodological reflection also involves evaluating the suitability of the chosen methods against potential alternatives. Since the thesis addresses different RQs across the three studies, method choice was guided by the purpose of each study rather than by a preference for one method throughout.

For Study 1, interviews could have been conducted. However, the main need at this stage was to establish a new concept based on established SCM and logistics research field where related terms were used inconsistently. An SLR was therefore more appropriate because it provided a structured basis for identifying, comparing, and reconciling concepts and terminologies (Durach et al., 2017). It also supported inductive theory building and contextualized explanation of the phenomenon studied (Durach et al., 2021).

For the analysis of the reports in Study 2, a quantitative contingency analysis (not contingency theory), similar to the approach used by de Lima et al. (2022) was considered. However, as de Lima et al. (2022) noted, a primary limitation of contingency analysis is its tendency to overlook certain relationships when inferences are provided post hoc. For instance, how many time certain terms appear together cannot necessarily build relationships between those terms. Thus, to avoid this limitation and ensure a deeper understanding of the data, qualitative coding was selected.

For Study 3, a case study approach could also have been considered. However, the fundamentals of casing (Ragin & Becker, 1992) did not align well with either the analytical framework or the sampling strategy of the study. The unit of analysis was the service configuration, which would have required a more consistent case boundary. Instead, the study relied on a heterogeneous sample of organizations to identify recurring patterns across different settings. For this reason, a case study design was not considered suitable, and semi-structured interviews across diverse contexts were better suited to capture variation in how circular logistics services are configured to create value.

Overall, alternative methods were possible in all three studies, but they were not equally suitable for the specific purpose of each one. The selected methods were judged to provide the best fit with the type of knowledge sought in each study

3.4.2. Research Quality

Reflecting on research quality, the trustworthiness of qualitative research is commonly assessed through four criteria: credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985; Stenfors et al., 2020). Rather than treating these as a generic checklist, Table 6 summarizes how each criterion is addressed in this thesis through the combined design of the three studies.

Table 3.4: Trustworthiness criteria and how they are addressed in this thesis (Lincoln & Guba, 1985)

Criterion	Concern	How addressed in this thesis
Credibility	Whether findings accurately represent the phenomenon studied	• Multiple data sources accessing different facets of CLS (academic literature, corporate reports, practitioner interviews) • Explicit theoretical frameworks guiding analysis in each study • Samples sized relative to the knowledge needed: 273 articles from 108 journals (Paper 1), 45 companies across six sectors (Paper 2), 15 respondents selected for maximum variation yielding 393 first-order observations, 25 second-order themes, and five archetypes with sufficient information power (Malterud et al., 2016)(Paper 3).
Transferability	Whether findings can inform understanding in other contexts	• Analytical rather than statistical generalizability (Gioia et al., 2013) • Archetypes and frameworks designed as conceptual tools applicable across settings • Detailed descriptions of sampling criteria, sector contexts, and coding procedures to support reader assessment
Dependability	Whether the research process is systematic and traceable	• Established analytical protocols followed across all studies (Durach et al., 2017; Seuring & Gold, 2012; Gioia et al., 2013)

		• Documented coding structures; intercoder reliability through independent coding by two researchers
Confirmability	Whether findings are grounded in data rather than researcher assumptions	• Abductive design providing a built-in mechanism for challenging premature closure through iterative movement between data and theory • Interpretations grounded in traceable empirical evidence; explicit analytical frameworks making reasoning open to scrutiny

Although quality and rigor have been given the highest priority in my capability, several boundaries should be acknowledged. The SLR is bounded by the search string. With progression in this field at some point the string might need revision. The content analysis relies on what organizations choose to disclose, introducing a reporting bias that supplementary use of company webpages and a second data collection round tried to mitigate. The interview sample is concentrated in the Nordic context, where regulatory maturity may shape CLS configurations differently than in other regions.

4. SUMMARY OF APPENDED PAPERS

This chapter summarizes the three appended papers that constitute the empirical foundation of the thesis. Since the next chapter discusses the findings in a coherent manner, to avoid repetition, this chapter will briefly introduce each paper and its main findings which will be used extensively in the discussion. Table 4.1 shows the brief overview of the appended papers.

Table 4.1: Overview of appended papers

	Paper 1	**Paper 2**	**Paper 3**
Title	Circular Logistics Services: More Than a New Name for Reverse Logistics	Logistics Services in a Circular Economy: Finding the Fit between Logistics Service Buyers and the Providers	Creating Value with Circular Logistics Services
Status	Under revision in an academic journal	Under revision in an academic journal	Conference paper
Focus	Conceptualizing CLS and comparing it with relevant research streams such as RL	Assessing LSB-LSP fit across sectors in circular contexts	Explaining the logistics-service-value connection in CE
Theoretical lens	Synthesis among logistics services and CE concepts	Contingency theory	Service-dominant logic and logistics utility
Brief contribution	Develops a novel CLS definition based on three building blocks: bundled activities, logistics structures, and six actor categories	Operationalizes fit as a multi-layered construct (strategic, functional, capability) and demonstrates that LSB-LSP fit is uneven and sector-dependent	Identifies five CLS archetypes showing how logistics services constitute, rather than merely supports, circular value creation

4.1. Paper 1

Circular Logistics Services: More Than a New Name for Reverse Logistics

Paper 1 responds to the gap that existing logistics concepts, particularly RL, are insufficient to capture the multi-directional, multi-lifecycle nature of resource flows in CE. While RL has been extensively studied for over three decades, it remains confined to linear return flows and does not account for the coordinated, multi-actor service provision that CSCs require. The study synthesizes 273 articles spanning multiple research streams, including CLSC, CSC, RL and waste management, to develop a unified conceptualization of CLS.

The findings reveal that CLS is constituted by three interrelated building blocks (Table 4.2): (i) strategically coordinated bundles of logistics activities planned and delivered as integrated service packages rather than performed in isolation; (ii) logistics structures describing the network formations, characterized by geographic scope, organizational form, and supply chain configuration through which circular flows operate; and (iii) a diverse set of traditional and non-traditional logistics actors organized into six categories, ranging from conventional LSPs to informal waste collectors and digital platforms. Based on the synthesis of these building blocks, the paper develops a novel definition of CLS that distinguishes it from reverse logistics by encompassing muliti-directional flows, multi-actor coordination, and service bundling across multiple life cycles and supply chains (see Paper 1, Section 5.1 for the full definition).

Table 4.2: Building blocks of CLS

Building block	Categories	Description
Strategically coordinated bundles of logistics activities	Context-specific service packages	Collection, sorting, transport, storage, and value recovery activities coordinated as integrated packages. Different R-framework activities (reuse to remine) generate demand for different bundles depending on industrial context.
Logistics structures	Geographic scope	Local to international networks determining the spatial reach of circular flows.
	Organizational form	Centralized or distributed configurations shaping how actors and nodes are coordinated.
	Supply chain configuration	Closed-loop, open-loop, cross-chain, or industrial symbiosis structures enabling multi-cycle resource flows.
Logistics actors	Internal CLS providers	OEMs and focal companies managing circular flows in-house, primarily within CLSCs.
	External CLS providers (reverse flow)	3PLs, 4PLs, waste management companies providing reverse logistics services.
	External CLS providers (forward flow)	Aftermarket service providers, resellers, redistributors, and retailers extending the product lifecycle by selling in the same or different market
	Informal logistics actors	Waste pickers, scavengers, and community-based collectors operating outside formal systems.
	Consumers and end-users	Connectors between life cycles through collecting, sorting, returning, and using refurbished goods.
	Digital tools and platforms	Information brokers and digital platforms connecting isolated logistics participants within supply chains.

4.2. Paper 2

Logistics Services in a Circular Economy: Finding the Fit between Logistics Service Buyers and the Providers

Paper 2 shifts from conceptualization to the relational dimension of CLS: whether current logistics provision fits with what their service buyers' circular strategies needs. This is a consequential question because of two reasons: first the service is the fundamental of source of exchange and to study logistics service in CE, it is crucial to understand what circular services are needed and what are available. Second, the misfit between buyer needs and provider capabilities constrains the operationalization of CSCs regardless of how well the concept itself is understood. Drawing on contingency theory, the study analyzes corporate reports from 45 large Swedish companies across six sectors to assess LSB–LSP fit across three complementary levels: strategic, functional, and capability (Table 4.3).

The findings reveal three core patterns. First, although individual companies adopt different R-framework strategies, their logistics needs converge at the sector level into shared system requirements. Second, the two LSP categories examined: freight-oriented and waste management-oriented providers, display complementary rather than overlapping strengths. Freight LSPs demonstrate stronger alignment in transport optimization, network coordination, and digital capabilities, while waste management LSPs show stronger fit in material processing, regulatory compliance, and specialized asset deployment. Third, no single LSP type achieves high fit across all three levels simultaneously for any sector. Fit is uneven, multi-layered, and sector-dependent (see Paper 2, Table V and Figure 3 for the detailed assessment).

Table 4.3: Multi-level fit framework

Fit level	Category	Description
Strategic	S1. Prevention	Value retention by preventing loss (refuse, reduce, reuse).
	S2. Life-extension	Keep products in use via service activities (repair, refurbish).
	S3. Material circularity	Replace virgin inputs with secondary materials (remanufacture, repurpose, recycle, recover).
Functional	F1. Logistics optimization	Planning, inventory management, and network efficiency.
	F2. Reverse-flow coordination	Take-back, consolidation, triage, and routing of returns.
	F3. Material processing	Sorting, treatment, and remanufacturing/recycling nodes.
	F4. Service logistics	Spare parts logistics, repair centres, and field service operations.
	F5. Platform coordination	Multi-actor coordination enabled by data exchange, digital portals, and platforms.
Capability	C1. Governance	Partner governance, contracting, integration mechanisms, and compliance.

	C2. Specialized assets	Specialized facilities and equipment that enable circular loops.
	C3. Circular know-how	Quality grading, compliance expertise, and design-for-circularity knowledge.
	C4. Digitalization and data-handling	Traceability, reporting, optimization, and automation capabilities.
	C5. Decarbonization	Low-carbon transport, electrification readiness, and energy sourcing.

4.3. Paper 3

Creating Value with Circular Logistics Services

Paper 3 addresses the value dimension that the first two papers leave open. Neither the conceptualization of CLS nor the assessment of buyer–provider fit explains how CLS creates value, that is, the mechanisms through which logistics services constitute rather than merely support circular value creation. Drawing on logistics utility concept and SDL, the study develops a four-layer analytical framework and applies it empirically across fifteen organizations spanning textiles, electronics, batteries, packaging, furniture, recycling, logistics technology, and municipal waste management.

The findings demonstrate that the traditional logistics utility framework undergoes a fundamental reconfiguration in CE: form utility shifts from a manufacturing-adjacent function to the central logistics activity, as sorting, grading, reconditioning, and material transformation become the pivotal logistics tasks that determine whether and how resources re-enter circular flows. The four utilities operate interdependently across multi-directional flows rather than independently along a linear chain. The study identifies five CLS archetypes (Table 4.4), each representing a distinct configuration of utility transformation, resource deployment, value logic, and institutional positioning.

Table 4.4: Five CLS archetypes

Archetype	Description	Key resources	Value logic
Assessment-to-Cascade	High-volume sorting into cascading value tiers	Specialist sorting knowledge	Direct resource retention through material differentiation
Specialist Transformation Hub	Specialist knowledge + specialized physical assets for complex material transformation	Specialist sorting knowledge	Resource retention + compliance value
Brand-Integrated Service	Circular logistics embedded in brand infrastructure; value captured indirectly	Specialist craft knowledge + own fleet/facilities	Indirect strategic value (customer loyalty, brand equity)
Circulation-as-a-Service	Possession reconfigured through rental/reuse;	Digital traceability +	Indirect value through scale aggregation

	platform orchestrates multi-actor loop	constitutive physical assets	
Digital Flow Orchestrator	Platform-level coordination; digital infrastructure is the service itself	Digital infrastructure as the service itself	Coordination fees through resolving information asymmetry

5. FINDINGS AND DISCUSSION

The purpose of this thesis is to develop a conceptual foundation for understanding logistics services in CE. The preceding chapter summarized the three appended papers. This chapter moves from summary to synthesis, interpreting the collected evidence through the theoretical perspectives established in Chapter 2 to address the RQs. Section 5.1 characterizes CLS as a distinct logistics service phenomenon. Section 5.2 explains CLS configurations for value creation.

5.1. CLS as a Distinct Logistics Service Phenomenon

To characterize CLS as a distinct logistics service phenomenon, it is necessary to demonstrate that CLS can conceptually and empirically address the CE principles, (Ellen MacArthur Foundation, 2013), where the current logistics service literature remain limited. This thesis develops this discussion in three ways: (i) by showing how CLS addresses and extends the limitations of RL, (ii) by establishing that CLS requires multi-level fit between the service providers and the buyers, (iii) by reconsidering the logistics utility framework for circular settings.

Addressing and extending RL limitations

The four assumptions identified in Chapter 2.2: a single reverse direction, disposition decided before logistics acts, a single-firm perspective, and a predetermined value category, define the limitations of RL as the fundamental logistics concept in CE. Even Mallick et al.'s (2024) configurational tool, the most recent operationalization of RL, retains all four: it designs one company's RL system given predetermined disposition categories. These are not surface level limitations that a future extension could fix; they are the assumptions that hinder CE configurations in many cases. The three building blocks (Paper 1) of CLS problematize RL to move beyond each assumption, supported by empirical evidence from Papers 2 and 3.

- The *single reverse direction* is replaced rather than expanded in CE. Concepts like industrial symbiosis flows are neither reverse relative to the originating chain nor forward relative to the receiving one (Paper 1). Product-service and rental arrangements involve continuous loops in which products move between users without returning to a point of origin. In Paper 3, the Circulation-as-a-Service archetype operates through exactly this continuous-loop logic, and the Digital Flow Orchestrator archetype dissolves directionality at the system level: the same infrastructure manages flows that are simultaneously forward for one actor and reverse for another.
- *Disposition decision prior to logistics acts* does not stand, when classification becomes an output of logistics rather than an input to it. Assessment, testing, grading, and legal reclassification under EPR are themselves logistics activities in CLS, and they produce the material identity that RL treats as pre-given. The centrality of form utility in Paper 3 reflects this shift. In the Assessment-to-

Cascade archetype, whether a returned flow becomes secondary raw material, remanufacturable core, or cascaded input to a different supply chain is determined within the logistics service, not before it.

- *The single-firm perspective* cannot accommodate the coordination problem CE presents. Paper 2 shows that no single LSP type achieves high fit across strategic, functional, and capability levels in any sector, which is a structural reflection of CE actor topology rather than an efficiency failure: the coordination problem no single focal firm can solve alone. The six-category actor typology developed in Paper 1, including informal collectors, municipalities, digital platforms, and consumers as logistics contributors, captures this distributed actor setting that the focal-firm perspective cannot represent.
- *The predetermined value category* fails where value is indeterminate or institutionally contingent. An EV battery at 80% capacity may be product or waste depending on jurisdiction; a by-product may be residual for one firm and input for another simultaneously. Paper 3 treats institutions not as coordination devices but as market-defining forces that constitute the operational boundaries within which logistics services operate.

The three CLS building blocks address these RL assumptions jointly. *Strategically coordinated service bundles* replace the sequenced execution of pre-classified flows with integrated bundles planned around specific circular settings rather than standalone sequential functions. For instance, construction requires forward flows alongside deconstruction and material reprocessing (Ding et al., 2023); textiles require collection, sorting, repair, and redistribution with rental-based reuse operating as a continuous loop (Papamichael et al., 2023). *Logistics structures* capture organizational, geographic, and supply chain configurations spanning open-loop, cross-chain, and multi-directional arrangements. *Logistics actors* identify six categories whose coordination proceeds without a single-firm perspective.

A remark which might be raised is that CLS includes RL as a component and this is just making the concept bigger rather than adding something new. The distinction is not about scope. CLS works under fewer assumptions than RL. RL-like setups are still possible within CLS where the four assumptions happen to hold, but CLS setups are not possible within RL because its assumptions rule them out. RL therefore remains useful wherever those assumptions apply (single-firm take-back, warranty returns, closed-loop remanufacturing). Together, these building blocks support the definition developed in Paper 1:

"CLS are strategically coordinated bundles of logistics services involving various logistics actors, within a combination of logistics structures, that enable the facilitation of circular resource flows in single or multiple life cycles, within, between, or across supply chains, both in forward and reverse directions, in order to maximize value recapture and recreation with a vision towards zero waste."

RL remains relevant as a component within CLS, but its assumptions make it insufficient as the organizing concept for the logistics demands of CE.

Requiring fit between logistics service buyers and providers

Since service is the fundamental basis of exchange (Vargo & Lusch, 2004, 2016), characterizing CLS as a service phenomenon requires assessing the exchange relationship between those who need CLS and those who provide it.

Drawing on contingency theory (Donaldson, 2001; Drazin & Van de Ven, 1985; Sousa & Voss, 2008), Paper 2 examines this fit at three levels.

- *Strategic fit* examines whether LSPs' circular orientation matches the CE context of their buyers: Freight LSPs align with product-centric strategies such as life extension and recommerce in manufacturing and textiles, while waste management LSPs align with material-centric strategies such as recycling and recovery in mining and construction sectors.
- *Functional fit* examines whether operational processes match: freight LSPs demonstrate strengths in transport optimization and digital traceability, while waste management LSPs show strengths in material processing and regulatory compliance.
- *Capability fit* examines whether underlying resources match: specialized sorting infrastructure concentrates in waste management LSPs, while service logistics and platform coordination capabilities sit with freight LSPs.

The interview evidence from paper 3 adds a broader dimension to this discussion. Across diverse industries, organizations managing circular flows handle circular logistics sometimes internally, sometimes through specialist actors, and in some cases with external LSPs. This reflects a structural reality: the capabilities CLS demands, particularly assessment, reconditioning, and multi-directional coordination, mostly sit outside the traditional LSP competence domain unless it's a very generic product without complex EoL handling requitement. Thus, no single provider type achieves high fit across all three levels for any sector. This is not only a result grounded in contingency theory, but also a part of the characterization of CLS itself. CLS is a service phenomenon whose demands span the boundary between provider categories that the linear economy created. The market distinguishes between freight and waste management; a distinction inherited from the separation of forward and reverse flows. CLS requires capabilities from both categories simultaneously.

One consequence of this misfit is visible in the third building block from Paper 1: internal CLS providers. The SLR identifies OEMs and manufacturers as one of six actor categories, and Paper 2 confirms this empirically. Several LSBs are addressing their circular logistics needs in-house, either by acquiring smaller companies with specialized assets and skills or by establishing dedicated subsidiaries to manage their circular agenda. They do so because traditional LSPs cannot yet provide the sector-specific, bundled service configurations that CE demands. CE is context-dependent by nature, and the logistics market has not reorganized to reflect this. On the other hand, waste management companies traditionally have long been working in this domain and now are appearing in a larger scale with more industry specific offerings. The persistent capability gap is therefore not a temporary market failure but a structural reflection of categorical boundaries that do not correspond to the building blocks of CLS.

Reconsidering utilities in CE

Value is exchanged and created through service (Vargo and Lusch, 2004, 2016), and the value contribution of logistics has traditionally been understood through form, time, place, and possession utilities (Lambert, Stock, et al., 1998; Coyle et al., 1993). The question is whether that framework remains adequate when logistics operates under CE conditions.

The utility framework was developed for linear supply chains where time and place were the core logistics functions and form utility was associated with manufacturing activities (Lambert, Stock, et al., 1998). Yet the building blocks identified in Paper 1 show that CLS activity bundles are dominated by sorting, grading, reconditioning, and assessment, activities that fall under form utility rather than time or place. The fit analysis (Paper 2) reinforces this: the capability gap between what CE demands and what providers offer is concentrated precisely in these form-utility capabilities, specifically material processing, service logistics, and circular know-how, functions that neither freight nor waste management LSPs fully cover. Paper 3 reveals that LSBs across sectors experience these transformation activities, alongside transport or storage, as the activities where the service outcome is determined in a circular way.

This means that the utility concept, the established vocabulary through which the logistics service literature explains value, needs to be reconsidered for CE. Without this reconsideration, the characterization of CLS remains incomplete. Its building blocks and actor configurations would be established, but the functional logic through which it creates value as a service would not. The evidence across the three studies, detailed in Section 5.2 through the archetypes and propositions, shows that this reconsideration produces a fundamentally different picture of what logistics functionally does. The need for reconsideration is itself part of the characterization: CLS is a distinct service phenomenon in part because the value concept that defines logistics as a service does not hold in its established form when applied to circular settings.

5.2. CLS Configurations for Value Creation

The findings across the three studies show that CLS creates value through its own service logic rather than as operational support to other actors' circular strategies. This section develops that logic by building from the utility foundation established in Section 5.1, through the conditions that shape configuration, to the five archetypes and seven propositions that formalize the logistics-service-value connection.

Utility transformation as the foundation of CLS value creation

Section 5.1 established that the logistics utility concept (Lambert, Stock, et al., 1998) can be reintroduced in CE. The evidence from Paper 3 makes the nature of this revision concrete. Across the empirical data, activities such as sorting, grading, testing, reconditioning, and material preparation consistently emerged as the activities where value is most visibly created.

- In the Assessment-to-Cascade archetype, specialist sorting transforms undifferentiated inbound material into cascading value tiers, each directed to a different recovery channel.
- In the Specialist Transformation Hub archetype, dismantling and material separation under regulated conditions convert EoL products into certified secondary resources.
- In the Brand-Integrated Service archetype, repair and reconditioning restore products to marketable condition. In each case, it is "form" utility, that determines whether the material acquires second-life value.

This pattern is consistent across the SLR (Paper 1), where the activity bundles defining CLS are dominated by transformation activities, and across the fit analysis (Paper 2), where the capability gap between what CE demands and what the market provides is concentrated in form-utility capabilities: assessment, material processing, and reconditioning. On this basis, the thesis proposes:

P1: *In CLS, form utility shifts from a manufacturing-adjacent function to the central logistics function, as sorting, grading, and reconditioning become the primary value-creating activities.*

Furthermore, the interviews reveal that the four utilities cannot be optimized independently in CE. Each depends on the others: time flexibility for circular materials enables transport consolidation (time utility), which enables geographic aggregation at sorting hubs (place utility), which enables access-based models like rental and subscription (possession utility), which in turn depend on form transformation to bring assets back into service.

- This interdependence is visible in the Circulation-as-a-Service archetype, where rental logistics requires simultaneous coordination of possession (who holds the product), time (turnaround speed), place (return network design), and form (cleaning, repair, inspection).
- It is equally visible in the Digital Flow Orchestration archetype, where platform coordination synchronizes all four utilities across actors who lack direct visibility of each other. The sequential logic assumed in linear logistics, where each utility can be addressed in isolation, does not hold.

P2: *The four logistics utilities operate interdependently in circular settings, with each utility enabling and being shaped by the others across multi-directional material flows.*

Conditions shaping CLS configurations

Within the transformed utility structure, four sets of conditions explain why CLS configurations take different forms across circular settings. These conditions are discussed as follows:

Specialist knowledge: The first condition is specialist knowledge. Across all five archetypes, the ability to assess, classify, and route materials emerges as the primary source of competitive advantage, supported by digital traceability and governance routines. In the Assessment-to-Cascade archetype, sorting knowledge determines how many value tiers can be extracted from a single inbound stream, directly shaping the economic viability of the operation. In the Digital Flow Orchestrator, the platform's coordination knowledge resolves information asymmetry between actors who cannot independently identify each other's material streams. This pattern resonates with Bask et al.'s (2010) argument that effective service production requires alignment between service strategy, business models, and modular operational processes.

In CLS, assessment and classification capability functions as a modular process, configured differently depending on the circular strategy it serves. Paper 2 findings also support this argument, where "circular know-how" is a capability level fit assessment tool.

P3*: Specialist knowledge, particularly assessment and classification capability, is the primary source of competitive advantage in CLS, determining the quality, pathway, and value of circular output streams.*

However, knowledge alone does not determine what is configurationally feasible. In materially intensive settings, the thesis finds that specialized physical assets play a different role than SDL's general formulation suggests. Paper 3 provides empirical examples through the Specialist Transformation Hub archetype. Specific properties of hazmat-compliant containers, industrial dismantling equipment, and certified processing facilities define the boundaries of what the service system can do. A sorting line's throughput capacity determines viable volumes, a container's safety specification determines which materials can be handled, a processing facility's certification determines which recovery channels are legally accessible. The fit analysis (Paper 2) provides structural evidence for this pattern with "specialized assets" as a capability for the LSPs. Waste management LSPs' fit advantage in mining, construction, and agro-food derives substantially from their processing infrastructure, not from knowledge alone. The Circulation-as-a-Service archetype shows the same co-dependence: reusable packaging systems whose material properties are system design parameters, not substitutable commodities.

P4: In CLS, specialized physical assets function as co-determinants of configuration that shape which service configurations are feasible, qualifying SDL's operant-operand hierarchy in material-intensive contexts.

Material properties: The second condition is material properties where the physical composition of the circulated resource constrains what CLS can do before any service design decision is made. A complex electronic assembly requires diagnostic testing, selective disassembly, and component-level sorting. A mono-material textile requires fibre identification and mechanical or chemical separation. A hazardous chemical compound requires ADR-compliant transport and environmentally controlled processing. These requirements are not strategic choices; they are physical constraints that determine feasible transformation pathways. Paper 2's fit analysis shows this at the sector level: the systematic variation in LSB needs across construction, textiles, batteries, and agro-food reflects underlying material differences, not just strategic differences. Paper 3's results reveal that practitioners experience material properties as a given factor that precedes and constrains service design. This finding aligns with evidence that recovery barriers vary by material type (D. Agrawal et al., 2023), that value preservation strategies differ by retention level (Vulsteke et al., 2024), and that residual product value shapes feasible transport distances and network configurations (Beames et al., 2021). In CE, the number and quality of output tiers achievable through sorting is determined by the material composition of the inbound stream, which helps to formulate the sorting operator's strategy.

P5: *Material properties impose a pre-configurational constraint on CLS: the physical composition of the circulated resource determines feasible transformation pathways prior to and independently of the service system design.*

Dual-value logic: The third condition is the dual-value logic that CLS navigates. Although CE is treated here as a service concept, the core aspect of it treats value as resource retention: maximizing material recovery, extending product lifespans, closing loops (Geissdoerfer et al., 2017; Ellen MacArthur Foundation, 2013). On the other hand, SDL's FP10 holds that value is phenomenologically determined by the beneficiary (Vargo & Lusch, 2016). Therefore, if the resources retention does not match the beneficiary's expectations, the retained value will be lost. CLS operates between these two conceptions, and the five archetypes resolve this tension in distinct ways.

- *Assessment-to-Cascade* and *Specialist Transformation Hub* resolve it through direct resource retention where the material's recovered value is the economic basis of the service.
- *Brand-Integrated Service* resolves it differently. Sometimes CLS can generate negative direct ROI on material recovery but creates value through customer loyalty, contract wins, and strategic differentiation, which is consistent with SDL's phenomenological value conception.
- *Circulation-as-a-Service* resolves it through multi-actor scale aggregation, where no single brand can sustain the logistics infrastructure alone but a platform aggregating multiple brands achieves viable volumes.
- *Digital Flow Orchestrator* resolves it through coordination fees for resolving information asymmetry. This differential resolution explains why archetypes that achieve equivalent circularity outcomes can have fundamentally different economic logics (e.g., Camilleri, 2025; Tapaninaho & Heikkinen, 2022)

P6: *CLS operates between a logic that prioritizes resource retention and a logic that prioritizes beneficiary-determined value, and the way a given service configuration resolves this tension shapes its economic viability and strategic positioning.*

Institutional arrangements: The fourth condition is institutional arrangements. EPR regulations, packaging legislation, and waste classification systems do not simply coordinate the markets within which CLS operates. They define whether returned materials are legally product or waste, thereby determining which actors can handle them, which processing steps are required, and which recovery channels are available. The Specialist Transformation Hub exists because regulation mandates compliance systems, such as the EU Batteries Regulation (European Union, 2023), that function as the organizational foundation of the service. In the Circulation-as-a-Service archetype, packaging legislation drives the scaling trajectory by requiring collection and reuse infrastructure that creates demand for logistics coordination. Conversely, institutions can also distort. Paper 3's interviews reveal cases where incineration overcapacity, sustained by existing waste management contracts, undermines recycling economics by offering a cheaper but less circular alternative. The fit analysis (Paper 2) shows that regulatory requirements shape sector-specific needs at the strategic level, confirming that the alignment between buyers and providers is institutionally mediated, not purely market-driven (Hopkinson et al., 2020).

P7*: In CE, institutions do not only coordinate value co-creation but define the markets and operational boundaries within which CLS can operate, extending SDL's characterization of institutions as coordination mechanisms (FP11).*

Synthesis of archetypes and propositions

Together, the five archetypes and seven propositions provide an understanding of how CLS are configured to create value and what conditions shape these configurations. Each archetype represents a coherent configuration shaped by the interplay of material properties, resource hierarchies, value logics, and institutional boundaries. The propositions formalize the conditions and relationships that explain why these configurations take the forms they do and how they create value. Importantly, these configurations are not universally transferable. The fit analysis (Paper 2) demonstrates that effective alignment between LSB-LSP is contingent, multi-layered, and sector dependent. The building blocks identified in Paper 1 show that CLS bundles, structures, and actor constellations vary substantially across circular settings. The archetypes capture these variations not as ad hoc differences but as patterned responses to the four conditions discussed above. A CLS actor seeking to create value through CLS therefore cannot adopt a single configuration and apply it across contexts. Instead, it requires an assessment of how material properties constrain feasible pathways, what combination of specialist knowledge and physical assets the setting demands, which value logic, resource retention or beneficiary-determined, governs the economic viability of the service, and what institutional arrangements define the operational boundaries. The CLS concept, the fit framework, and the archetypes together offer a structured basis for conducting that assessment. Table 5.2 summarizes the propositions, their theoretical basis, and their contributions.

Table 5.1: Conceptual propositions synthesizing RQ2

#	Proposition	Theoretical Basis	Contribution
P1	In CLS, form utility shifts from a manufacturing-adjacent function to the central logistics function, as sorting, grading, and reconditioning become the primary value-creating activities.	Logistics utilities (Lambert et al., 1998); rehabilitates Shaw (1994) critique	Redefines what logistics functionally does in CE; establishes form utility as the distinguishing characteristic of CLS
P2	The four logistics utilities operate interdependently in circular settings, with each utility enabling and being shaped by the others across multi-directional material flows.	Logistics utilities (Lambert et al., 1998); addresses Shaw (1994) critique	Replaces the sequential utility logic of linear logistics with an interdependent model suited to CE
P3	Specialist knowledge, particularly assessment and classification capability, is the primary source of competitive advantage in CLS, determining the quality, pathway, and value of circular output streams.	SDL FP4 (Vargo and Lusch, 2016); Bask et al. (2010) on service modularization	Confirms FP4 for CLS; identifies assessment as the specific operant resource where value is most visibly created
P4	In CLS, specialized physical assets function as constitutive operand resources that co-determine which service configurations are feasible, qualifying SDL's operant-operand hierarchy.	Qualifies SDL FP4 (Vargo and Lusch, 2016; Lusch and Vargo, 2014)	Introduces a boundary condition for SDL in material-intensive contexts; physical assets are not fungible but constitutive
P5	Material properties impose a pre-configurational constraint on CLS: the physical composition of the circulated resource determines feasible transformation pathways prior to and independently of the service system design.	New construct; supported by Agrawal et al. (2023), Vulsteke et al. (2024), Beames et al. (2021)	Introduces material-pathway determinism as absent from both SDL and CE logistics literature
P6	CLS operates between a logic that prioritizes resource retention and a logic that prioritizes beneficiary-determined value, and the way a given service configuration resolves this tension shapes its economic viability and strategic positioning	Integrates SDL FP10 with CE value logic (Geissdoerfer et al., 2017; Weissinger, 2022)	Formalizes the dual value logic at the SDL-CE interface; shows archetype-specific resolution
P7	In CE, institutions do not only coordinate value co-creation but constitute the markets and operational boundaries within which CLS can operate.	Extends SDL FP11 (Vargo and Lusch, 2016); Vlajic et al. (2018); Hopkinson et al. (2020)	Elevates institutions from contextual factors to constitutive forces in CLS

6. CONCLUSION

This thesis conceptualized CLS and developed an understanding of how they are configured to create value in CE. The central finding is that CLS is not a relabeling of RL but a service system with its own constitutive building blocks, its own structural alignment challenges between providers and buyers, and its own value-creating logic. Across three studies, the thesis demonstrates that logistics in CE is required to do fundamentally more than move and store products but also assess, sort, transform, and route resources across multi-directional flows, multi-loop resource circulation, and diverse actor constellations.

6.1. Implications for Theory

A theoretical contribution, as Whetten (1989) argues, must alter the underlying logic of how a phenomenon is understood, not merely add variables to existing models. Sutton and Staw (1995) sharpen this further: the contribution must explain why relationships hold, not just that they exist. The contributions below are assessed from the influences of these views.

Advancing the CE and logistics service literature

The CE literature has developed vocabulary for circular strategies (Kirchherr et al., 2017, 2023; Reike et al., 2018), supply chain structures (Batista et al., 2018; Farooque et al., 2019), and business models (Bocken et al., 2016; Lüdeke-Freund et al., 2019). The logistics service literature has established the utility framework for explaining how logistics creates value (Coyle et al., 1993; Lambert, Stock, et al., 1998). Neither has supplied a conceptualization that connects them by specifying what logistics services in CE consist of and how they differ from what RL captures. This thesis contributes that conceptualization in three ways.

First, it makes the RL–CE relationship theoretically precise. Batista et al. (2018a) and Sehnem et al. (2019) converge in identifying RL's insufficiency for CE but delimited in specifying what the adequate logistics service concept would be. The thesis contributes to that gap by identifying the four assumptions on which RL falls short and by showing that CLS moves beyond each. This is what Sandberg and Alvesson (2021) call an ordering contribution, where a previously unstructured phenomenon is categorized in theoretically productive ways. It gives researchers a vocabulary that matches the actual scope of logistics in CE.

Second, it reconfigures the logistics utility framework for circular settings. The finding that form utility shifts from a manufacturing-adjacent function to the central logistics activity in CE, and that the four utilities operate interdependently rather than sequentially, alters what the framework explains. Lambert, Stock, et al.'s (1998) model was developed under linear-economy conditions in which material identity is a given input to logistics. In CE, material identity is produced by logistics activity, and form utility is no longer a separable stage. Shaw (1994) had earlier highlighted limitations in the utility model; the thesis provides the empirical re-examination under circular conditions. In Whetten's (1989) terms, this is a revision of the How and Why of the utility framework: it specifies that form, place, time, and possession utilities now relate interdependently rather than sequentially, and why they do so, because material identity in CE is produced by logistics activity rather than given to it. Following Sandberg and Alvesson (2021), this moves the contribution beyond ordering into explaining theory, which clarifies how and why a set of relationships holds under changed conditions.

Third, it positions logistics embedded in CE rather than a support function. Paper 3's archetype analysis shows that whether a material flow produces secondary raw material, a re-manufacturable core, a cascaded input, or a circulated service depends on how assessment, routing, and transformation are bundled, not on a strategic intent set outside logistics. The common view is that strategy defines the circular loop and logistics closes it. In the CLS view, logistics configurations help decide which loops are possible in the first place. These reframing questions a view taken as given in both the CE and logistics literatures, that logistics is downstream of circular strategy. Such a move carries an element challenging the phenomenon in study which can be termed as theory provoking (Sandberg & Alvesson, 2021). As mentioned in chapter 2.5, this thesis does not want to limit itself to a specific theorizing style, the main idea of this discussion above was to reflect on different ways of contributing theoretically.

Adding to contingency theory

Contingency theory holds that organizational effectiveness depends on the fit between internal configurations and external demands, and that no universally optimal form exists (Donaldson, 2001; Sousa & Voss, 2008). In CE research it is acknowledged that business models lack "context sensitivity" (Lüdeke-Freund et al., 2019, p. 56) and a contingency theory perspective could be useful in this regard.

The thesis adds to this theory in the CE-logistics domain, a specific operationalization aspect. The fit can be assessed simultaneously at strategic, functional, and capability levels. These three levels are not alternative ways of measuring the same thing; they capture different dimensions of alignment that can vary independently. A provider may be strategically aligned with a buyer's circular ambitions yet lack the functional processes or capability base to deliver.

This multi-level operationalization makes two contributions. First, it demonstrates that the three-layered structure is necessary because fit assessed at any single level misrepresents the actual alignment. Freight LSPs achieve high strategic and functional fit with product-centric sectors such as textiles and manufacturing yet face capability gaps in assessment and material processing. Waste management LSPs achieve high capability fit in material-centric sectors such as mining and construction yet lack the service logistics and digital coordination that functional alignment requires. Second, the thesis reveals that the misfits are not temporary gaps but a structural one, rooted in how the logistics market inherited its service providers categories from the linear economy. The freight-waste management distinction does not correspond to the building blocks of CLS, which require capabilities from both domains. This connects the fit analysis to the CLS conceptualization and explains why the capability gap persists despite growing CE demand. Whetten (1989) argues that theoretical contributions to boundary conditions must explain why anomalies exist, not merely identify them. The categorical mismatch between the market's structure and the phenomenon's building blocks provides that explanation.

Qualifying SDL for material-intensive CE contexts

SDL provides the meta-theoretical framework through which the thesis examines value creation (Vargo & Lusch, 2016). The thesis uses SDL's foundational premises as the analytical lens in the CE context and the result shows that operant resources are the primary source of competitive advantage (FP4; P3), value is co-created through resource integration (FP6), and value is uniquely determined by the beneficiary (FP10). However, it also identifies two boundary conditions that qualify SDL for material-intensive service contexts.

The first concerns the operant-operand hierarchy. SDL's FP4 positions operant resources (knowledge and skills) as fundamental and operand resources (physical assets) as acted upon. The thesis finds that this holds in configurations with low material intensity, such as the Digital Flow Orchestrator. In materially intensive configurations, such as the Specialist Transformation Hub, specialized physical assets co-determine which configurations are feasible (P4). A sorting line's throughput, a hazmat container's specification, or a reusable packaging system's material properties define the service system's boundaries. Physical assets in these settings are not passive inputs but co-determinants of what the service can accomplish.

The second concerns institutions. SDL's FP11 treats institutions as coordination mechanisms enabling and constraining value co-creation. The thesis finds that in CLS, institutions such as EPR regulations and waste classification systems define whether markets for recovered resources exist and under what terms actors can participate (P7). They determine whether a returned material is legally product or waste, which shapes the entire downstream configuration. This extends FP11 by showing that institutions in regulated material-flow contexts are market-defining forces, not coordination devices.

These qualifications respond to calls for integrating SDL and CE empirically (Weissinger, 2022) and for multilevel, inter-organizational perspectives on CE (Graessler et al., 2024). They are offered as boundary conditions, specifying the circumstances under which SDL's general premises require modification, rather than as refutations. By confirming, extending, and qualifying SDL through empirical application in CLS, the thesis demonstrates how an established meta-theoretical framework can be both validated and refined when applied to a context that its originators did not anticipate.

6.2. Implications for Practice

For practitioners, the thesis offers three actionable insights. First, the CLS building blocks and definition provide a common vocabulary for organizations seeking to develop, procure, or evaluate CLS. For LSPs, the framework clarifies which service bundles, structures, and actor partnerships are required for specific circular settings, rather than treating CE as a generic extension of existing operations. This is particularly relevant for freight-oriented LSPs, who have great potential for CE transition at the systemic level (Mate et al., 2026) but face a capability gap when confronted with the assessment, sorting, and reconditioning demands of circular strategies. For LSBs, the same vocabulary supports more precise specification of what services to request and from whom.

Second, the multi-layered fit framework offers a diagnostic tool for both sides of the buyer-provider relationship. The finding that fit is uneven across strategic, functional, and capability levels, and that freight and waste management LSPs display complementary rather than overlapping strengths, has direct implications for procurement decisions and partnership design. LSBs pursuing circular strategies should assess not whether a single LSP can satisfy all circular demands, but which combination of provider types and collaborative arrangements achieves alignment across all three levels. LSPs, in turn, can use the framework to identify where their own strengths lie and which complementary partners they need to serve circular buyers. The implication is bundled service models and complementary partnerships rather than traditional single-provider outsourcing.

Third, the five CLS archetypes provide a practical typology for understanding how value is created through logistics in specific circular contexts. The archetypes are defined by service logic rather than actor identity, so the same organization may operate across multiple archetypes depending on the material stream and circular strategy involved. For LSPs, the archetypes offer a basis for deciding which configurations to develop, invest in, and specialize in, giving them a means of standardizing their offerings in a domain where sector-specific demands otherwise resist standardization. For LSBs, the archetypes clarify which configuration matches their circular strategy and therefore which type of provider or partnership to engage. For policymakers, the finding that institutions constitute the markets within which CLS operates, rather than merely regulating them, underscores the importance of regulatory design. The EU Batteries Regulation (European Union, 2023), the revised Waste Framework Directive introducing mandatory EPR for textiles (European Commission, 2025), and the Ecodesign for Sustainable Products Regulation (European Union, 2024) all create logistics demands that cannot be met by existing infrastructure. These regulations should therefore be accompanied by explicit consideration of the logistics service systems needed to operationalize them.

6.3. Research Boundaries and Delimitations

Dubois & Gadde (2002, p. 558) observe that in the empirical world to which open system studies apply, there are no natural boundaries; researchers must decide which actors, activities, resources, and interdependencies to include, and any expansion of those boundaries provides potential discoveries of new interdependencies. The boundaries of this thesis are drawn deliberately and reflect the scope of the licentiate within the broader doctoral project.

The thesis takes a service system perspective where the unit of analysis across the studies has been the logistics services. Although logistics actors may appear to be in focus, especially in Paper 2, what was actually analyzed was the services they offer and need. This service-based perspective is not a limitation; however, it is acknowledged that focusing on services rather than actors means the thesis does not engage deeply with the specific dyadic or triadic relationships between organizations, nor with the detailed material properties of what flows through the service system. These aspects require a supply chain level engagement that the planned studies will take up (see Section 6.4).

Empirically, the thesis is concentrated in the Swedish-Nordic context, where regulatory maturity, particularly EU-level CE legislation, shapes the conditions under which CLS configurations emerge. The SLR (Paper 1) draws on international literature, but the content analysis (Paper 2) and interviews (Paper 3) are situated within the Swedish industrial landscape. Following Gioia et al., (2013), the findings are analytically rather than statistically generalizable, where the archetypes, propositions, and frameworks are designed as conceptual tools whose applicability to other contexts remains to be examined. The thesis is grounded in critical realism, which has informed how its boundaries have been framed. Future studies will dive deeper into the mechanisms underlying the observed configurations through retroductive reasoning.

6.4. Planned Future Studies

The licentiate thesis covers the service system domain of CLS: what it is, the service provision fit/misfit between the provider and buyer, and how the services create value. The doctoral project's next phase moves from conceptualization to the synthesis examining how CLS operates within specific CSC configurations. Two case studies are planned, each selected to ground the conceptual findings of the licentiate in empirically rich, sector-specific contexts where CLS configurations can be observed in operation.

The first planned study investigates the CSC and logistics structures of second-life EV batteries. The EU Batteries Regulation mandates sustainability and circularity requirements across the battery lifecycle, including collection obligations, recycled content targets, and digital battery passports (European Union, 2023). These regulatory demands create a logistics service system of considerable complexity: batteries classified as dangerous goods require ADR-compliant (European agreement for transporting dangerous goods by road) transport and specialized packaging; state-of-health assessment determines whether a battery enters second-life applications or recycling; and the transition from "product" to "waste" classification triggers different regulatory regimes with distinct logistics implications. This case provides an opportunity to examine how the Specialist Transformation Hub and Assessment-to-Cascade archetypes identified in the licentiate manifest within a specific supply chain, and how the ownership of the EV batteries determines the CSC structure and how OEMs, specialist processors, and logistics actors are structured to manage these flows. The study will employ a single embedded case design (Dubois & Gadde, 2002), tracing the battery from first end-of-use through assessment, repurposing or recycling, to re-entry into the economy.

The second planned study examines textile circularity, where the revised Waste Framework Directive, which entered into force in October 2025, introduces mandatory EPR schemes for textiles requiring producers to finance collection, sorting, reuse, and recycling (European Commission, 2025). Sweden is implementing this framework with ambitious targets for textile waste reduction. The textile case is particularly suited for examining the Assessment-to-Cascade and Brand-Integrated Service archetypes, given the centrality of sorting and grading in determining whether garments are directed toward reuse, repair, or fibre recycling. The study will trace how CLS configurations are organized within the emerging EPR infrastructure, with attention to how service structures form between brands, sorting operators, and redistribution actors.

Together, these two studies will move towards how CLS is structured within specific supply chains, how resources are utilized across circular flows, and how the archetypes and propositions developed in this thesis hold, require modification, or reveal new mechanisms when examined in depth. The synthesis of the actor domain and service system domain findings will constitute the final phase of the doctoral project.

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Appendix

Appendix 1: Evolution of Reverse Logistics Definitions

Author(s)	Year	Exact Definition	Research Context
Lambert & Stock	1981	"Going the wrong way on a one-way street because the great majority of product shipments flow in one direction" (p. 19)	General logistics
Murphy & Poist	1989	"Movement of goods from a consumer towards a producer in a channel of distribution"	General logistics
Stock	1998	"The role of logistics in product returns, source reduction, recycling, materials substitution, reuse of materials, waste disposal and refurbishing, repair, and remanufacturing" (p. 20)	General logistics
Carter & Ellram	1998	"The process whereby companies can become more environmentally efficient through recycling, reusing, and reducing the amount of materials used" (p. 85)	Environmental SCM
Rogers & Tibben-Lembke	1999	"The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin for the purpose of recapturing or creating value or proper disposal" (p. 2)	General logistics; most widely cited RL definition
Fleischmann et al. (cited in Tombido et al., 2018)	1997	Five main activities: collection, transportation, inspection, disposition, and distribution and sales	RL network design
Dowlatshahi	2000; 2005	RL system should reflect "the basic logistics' rule of right time, right place, right price, right quantity, right service, and right quality"	Strategic/operational factors for RL
Guide & Van Wassenhove	2009	RL positioned within CLSC as the mechanism for product acquisition from end users, moving products to point of disposition including testing, sorting, and disposition decisions	CLSC; manufacturing
Bai & Sarkis	2013	"Not all RL functions will be similar and generic. For example a warranty return RL network would not have the same functions as a recycling RL network. The availability of each of RL function services will also be dependent on the product life cycle, industry, and design of the RL network"	3PL selection; multi-sector
Agrawal, Singh & Murtaza	2015	"RL refers to the sequence of activities required to collect the used product from the customers for the purpose of either reuse or	SLR of 242 articles; manufacturing,

		repair or re-manufacture or recycle or dispose of it" (p. 76)	automotive, electronics
Mimouni et al. (cited in Prajapati et al., 2019)	2015	"The logistics activities inside an organization but in opposite direction, opposite to the normal regular activities of the supply chain"	General RL
(Govindan et al., 2015)	2015	"reverse logistics, in general forms, start from end users (first customers) where used products are collected from customers (return products) and then attempts to manage EOL products through different decisions are undertaken including recycling (to have more raw materials or raw parts), remanufacturing (to resale them to second markets or if possible to first customers), repairing (to sell in the second markets through repairing), and finally, disposing of some used parts"	General RL and CLSC
Ripanti et al.	2016	RL activities "consist of direct reuse/resale, repair, refurbishment, remanufacturing, recycle, incineration, and landfilling. These activities are also similar to the definition of RL by Rogers and Tibben-Lembke (1999)"	CE and RL comparison
Tombido et al.	2018	"Reverse logistics is concerned with the management of anything that goes in the opposite direction to the forward traditional supply chain in the form of returns"	3PL in RL; multi-sector
Batista et al.	2018; 2019	"Despite enabling reverse flows, we argue that the reverse logistics narrative is insufficient to address the wide scope of restorative processes and related supply chain configurations that occur in the circular economy... the restorative loops may not involve 'returns' to the focal company. Rather, they may involve forward loops (open-loops) comprising an alternative circular flow of materials"	CSC; CE
Sehnem et al.	2019	"In the inner cycle of nested concepts sits reverse logistics. Closed loops and reverse logistics are both focused on flows of resources and the exchange of by-products... CE concepts include closed loops concepts but take it further with a broader perspective looking at flows of resources and wastes within and across supply chains"	CE conceptual analysis
Pushpamali et al.	2019	RL in construction "mainly discussed with the focus on end-of-life waste management"; RL options defined as: "(a) direct reuse... (b) repair... (c) refurbish... (d) remanufacture... (e) recycle"	Construction industry

Paula et al.	2020	"From a practical perspective, some organizations consider reverse logistics only from the time the waste is generated and should be sent for recycling or environmentally sound disposal. However, Reverse Logistics should be considered throughout the product lifecycle"	General RL; lifecycle perspective
Tesfaye & Kitaw	2021	"RL is different from waste management for it embraces value-adding activities such as testing, sorting, refurbishing, recycling and redistribution waste products"	Plastics industry
Melo et al.	2022	"The bridge between the return items in the chain and the possible value recovery activities, as well as the wastes' final disposal"; note: "the concept of activities that make up the RL processes is still quite broad and little-discussed"	RL process modelling
Martins et al. (citing Brazil NSWP, 2010)	2022	RL constitutes "an instrument of economic and social development, characterized by a set of actions, procedures and means designed to enable the collection and return of solid waste to the business sector, for recovery, in its cycle or other production cycles, or other environmentally proper final disposition"; also found RL focuses on SDG 9 and 12 but "the circular aspect is missing"	Policy (Brazil); sustainability
Ding et al.	2023	Proposed "circular logistics integration (CLI)" as "the coordination and collaboration between FL and RL specialized actors to improve CE performances of the material and resource flows"; argued "FL and RL must be seen no more as only temporary events, but as planned and controlled operations in an integrated system"	Construction industry
Nunes et al.	2023	"RL and WM activities take place within a network of facilities known as a reverse supply chain (RSC) or reverse network, which is characterized by the flow of materials and information through reverse channels between these facilities"	Waste management
Agrawal et al.	2023	Categorized RSC coordination issues into five categories: strategic decisions, functional decisions, government support, risk attitude, and consumer behaviour	RSC coordination
Mallick et al.	2024	Developed a support tool for designing reverse logistics systems, retaining return-flow and disposition framing	RL system design