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Last but not Least

A Paradoxical Sustainability Exploration in Last Mile Delivery and City Logistics

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Last but not least: A paradoxical sustainability exploration in last mile delivery and city logistics

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"Paradox has always been the animating life force, the heart of the human condition, and therein lies my problem"

Hannah Gadsby, art historian, and comedy genius

At the height of the pandemic, I sat isolated at home in Berlin with a newborn. As a family, we quickly realized that Germany was not an ideal place to live in a pandemic, and the homesickness was great. Thus came the idea of returning home, which, in turn, sparked the idea of revisiting my thoughts of returning to do a PhD after 10 years away from academia. I looked around to see what problems I could try to tackle, and the sight of cardboard boxes overflowing the waste bin and the notes from neighbors inquiring about their missing parcels emerged as a starting point. An investigation into ongoing projects at Hanken SCM & SR showed me a Nordic research project (i-Smile) in sustainable last mile delivery, and so my research proposal was born. I started my PhD journey at Hanken in September 2021, not knowing what kind of paradox of academic life I'd stumbled into. The journey has had many ups and downs, but has a nice ending as I graduate and get to write these acknowledgments and thank everyone who has been part of this journey.

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Helleke Heikkinen

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LIST OF ABBREVIATIONS

LMD	Last Mile Delivery
LSP	Logistics Service Provider
CF	Cognitive Frame

1. INTRODUCTION

During the Covid-19 pandemic, many people found themselves in a situation where they sat in their city flats ordering things online. This was one of the boosting factors that took e-commerce, and hence last mile delivery, towards new heights. In this time of urbanization, where more and more people move to cities and engage in online shopping, the last mile deliveries are becoming increasingly important. This is not just for e-commerce retailers but also for cities and non-urban communities affected by increased deliveries. More traffic equals more emissions and several other challenges at a time when sustainability is on every agenda, from city authorities to companies and individual consumers. These challenges come at a time when society and businesses have woken up to the reality of climate change, biodiversity loss, and many other grand societal challenges and inequities that pose contradictory demands on any area of business. This thesis delves into an exploration of last mile delivery and city logistics with an interest in understanding the nuances of sustainability. This first section is an introduction to the thesis, outlining the background and introducing the aim and research questions, as well as the positioning of the essays in both literature and theory.

1.1 Background and research problem

Last mile delivery (LMD) and city logistics are topics that have gained significant research momentum in past years. The urban LMD scene is undergoing significant changes (Villa and Monzón, 2021), partly due to due to urbanization and the growth in e-commerce (Boysen et al., 2021). The complexity and cost of LMDs have spurred innovations such as unmanned drones, delivery robots (Boysen et al., 2021), pick-up points, trunk delivery, reception boxes, parcel lockers, crowdsourcing logistics, and dynamic pricing (Mangiaracina et al., 2019). The COVID-19 pandemic accelerated the adoption of technology in LMD, revealing new development opportunities (Ketchen & Craighead, 2020). Also, app-based on-demand delivery services are rapidly growing (Dablanc et al., 2017), impacting city infrastructure (Bissell, 2020), as the platform economy keeps introducing new concepts to meet customer demands (Huschebeck & Leonardi, 2020). This LMD transformation is having a profound impact on cities globally and is one of the driving change factors impacting city logistics (Correia et al., 2022). One example of this transformation is e-grocery delivery, the empirical context of essay 3 in this thesis, which is increasing and introducing new technologies and more LMDs on city streets.

The last link of the supply chain, where an order is delivered to the final customer, is what is commonly referred to as last mile delivery (Lim et al., 2018). LMD can be deliveries to both urban and non-urban areas (Vakulenko et al., 2022), even if LMD is often associated with deliveries in cities. The urban last mile is one part of city logistics, which is described as all the logistics services that are involved in moving goods and meeting different stakeholders' logistics needs in cities (Dablanc, 2007). In both city logistics and LMD, synonyms and various concepts are used. The literature review (section 2.3) will discuss these further.

Sustainability is at the core of many LMD and city logistics concerns. Despite its growing importance, sustainability progress in this field remains slow (Kiba-Janiak et al., 2021). Some of the persisting challenges include pollution, congestion, and safety issues (cf. Moncef and Monnet Dupuy, 2021; Pourrahmani and Jaller, 2021) that become even more topical amidst changing consumer preferences (Villa & Monzón, 2021) and an increased demand for speedy on-demand LMDs (Bjørgen, Bjerkan, et al., 2021). Complexity is added by introducing new delivery technologies and the diverse set of stakeholders involved (Boysen et al., 2021; Mangano & Zenezini, 2019). The stakeholders include, for example, city residents, customers, logistics service companies (LSPs), retailers, city authorities, and political decision-makers.

With the promotion of sustainable city logistics and the introduction of various initiatives on, e.g., EU level, sustainable city logistics, and LMD is receiving increasing attention (Browne et al., 2018). Retailers and logistics service providers (LSPs) are some of the stakeholders that can influence the sustainability of LMDs most (Bask et al., 2016), and through their communication, they also influence consumers' abilities to make sustainability-informed choices (Sallnäs & Björklund, 2023). City authorities also have an impact but most often respond reactively to changes in the city logistics space (Browne et al., 2018), and political anchorage needs to be in place to further sustainable city logistics development (Bjørgen & Ryghaug, 2022). This illustrates a space filled with different interests and goals. Even if all these stakeholders have an interest in sustainability, their actions regarding sustainability might differ, and consensus and agreement can be challenging to reach (Gammelgaard, 2015). Many barriers also remain for companies who wish to adopt sustainable practices (Sallnäs & Björklund, 2023).

Sustainability remains a multi-level challenge with many tensions and research has dealt with these challenges in a very instrumental way (Hahn et al., 2015, 2018). This is also the case in LMD research, which has increasingly paid attention to sustainability but focused on economic aspects and environmental sustainability in the form of emission reduction, leaving a need for considering, for example, social sustainability (cf. Heikkinen, 2024; Nenni et al., 2019). Previous research in both LMD and city logistics has revealed tensions, such as one between urban planning and the faster development cycles of companies (Kin et al., 2024) or cities needing good quality logistics services while being rather unwelcoming towards how they take up space (Buldeo Rai et al., 2022). Some of the research outcomes have been contradictory when some studies indicate home deliveries reduce emissions when individuals don't drive to stores by car (Siragusa & Tumino, 2021), while others have pointed out that this emission reduction is mainly dependent on how the delivery is executed and the way the individual would have gone to the store in the first place (Bjørgen, Bjerkan, et al., 2021).

While tensions remain a natural part of dealing with complex contexts (Seuring & Müller, 2008), understanding and utilizing them for beneficial outcomes is possible for innovation and development (Smith et al., 2017; Smith et al., 2016; Smith and Lewis, 2011). The presence of tensions in literature and the need for a more nuanced sustainability view in last mile and city logistics allows tensions to be theorized utilizing paradox theory. Paradox theory, which aims at transcending either/or thinking for the benefit of embracing both/and dualities (cf. Smith and Lewis, 2011), provides an

opportunity, as paradox research within logistics remains nascent. It also offers a chance to challenge how sustainability is often viewed in these research contexts. Concepts related to paradox theory, including the framing of sustainability and power dynamics, provide excellent research opportunities that have not yet been fully explored. Examples like Moncef and Monnet Dupuy (2021), who have pointed out the sustainability paradoxes in the sharing economy stemming from payment structures and collaboration challenges in LMD, show the utility of a paradox perspective and the value it can bring to understanding complex tensions embedded in the context of LMD. Also, within paradox theory research in supply chains, there is space for contribution as research so far has focused mainly on describing tensions on an organizational level (Carmine & De Marchi, 2022; J. Zhang et al., 2021), providing an opportunity to contribute both to the context of LMD and city logistics as well as theoretically to paradox theory. In the LMD and city logistics context, where continuous change has been evident, novel research perspectives can enrich theory and practice. This thesis contributes by exploring the tensions from a paradox theory perspective for the benefit of a more nuanced sustainability understanding of LMDs and city logistics.

1.2 Aim and research questions

The thesis aims to explore sustainability within last-mile deliveries and city logistics through paradox theory to achieve novel insights into both the contexts themselves and how to address sustainability within them. The research utilizes paradox theory to better understand the phenomenon of interest, sustainability. The following research questions support the aim:

- **RQ1:** How might we better understand sustainability in last mile delivery and city logistics?
- **RQ2:** How do tensions create sustainability implications in last mile delivery and city logistics?

These research questions are addressed in three empirical studies, referred to in this composite thesis as Essays 1, 2, and 3. In the research, sustainability is a focal point around which the other concepts, such as cognitive frames, tensions, and power, are wrapped. In this sense, sustainability can be seen as both a concept and a phenomenon of interest within this research. The other theoretical concepts serve as ways to elucidate its complexities, implications, and effects. The research in this thesis is summarized in Table 1. The thesis employs a qualitative research methodology to explore the topic, and the essays are all case studies based on rich data, including semi-structured interviews, secondary data, observations, and workshops.

Table 1 An overview of the research in this thesis

Empirical Context	Last mile delivery and city logistics and
Theoretical Concepts	Cognitive frames (sensemaking), tensions, paradox, power
Other concepts in essays	last mile delivery, city logistics, e-grocery retail, e-grocery delivery
Phenomenon of Interest	Sustainability
Literature streams	Last mile delivery, city logistics, e-commerce retail, e-grocery retail, sustainable supply chains

1.3 Thesis outline, positioning in literature, and limitations

This composite thesis comprises three essays and a summary section (kappa) divided into five main sections. Following this introduction, Section 2 provides a positioning in theory and literature, Section 3 discusses the methodology, Section 4 provides a summary of the essays, and Section 5 synthesizes and discusses the results. The first essay looks at how managers of LSPs and retailers make sense of sustainability in LMD. It draws from LMD and retail research and uses cognitive frames as a theoretical lens (Preuss & Fearne, 2022). The second essay detects tensions in e-grocery delivery and discusses their implication for sustainability on three levels (individual, organizational, and system). It taps into e-grocery and retail logistics literature and uses paradox theory for its exploratory purpose. The third essay discusses how cities respond to tensions in sustainable city logistics development using the types of power framework presented by Hardy (1996). In these three essays, the thesis uses qualitative empirical data gathered from the perspectives of retailers, LSPs, and cities. The essays and their positioning in theory and literature are summarized in Table 2.

Table 2 Positioning of the essays in theory and literature

	Theory	**Empirical Context**	**Main Literature Stream(s)**	**Phenomenon of Interest**
Essay 1	Cognitive frames	Last mile delivery	(Sustainable) last mile delivery,	Sustainability
Essay 2	Paradox theory	E-grocery delivery /last mile delivery	E-grocery retail, (sustainable) last mile delivery	
Essay 3	Paradox theory & types of power	City logistics	City logistics	

The thesis research is limited by the need for longitudinal data and the complexity of paradox theory concepts. Studying the persistence of paradoxical tensions is limited by using situational data in the case studies. Paradox theory is a developing theory with many related concepts and models that become challenging to incorporate fully in individual essays. Thus, the thesis uses the three essays to explore many paradox concepts in debt but leaves deeper salience exploration for future studies. This means that further exploration could be done to deepen the analysis with longitudinal data in the future. The empirical data, which is primarily Nordic, also poses some geographical limitations. The qualitative case study method chosen gives richness to the data and leaves space for exploring causal relationships quantitatively in the future. Limitations are further discussed at the end.

Key concepts

This section briefly outlines the definitions of the key concepts used in this thesis. Section 2, where relevant literature is reviewed, further discusses them.

Paradox and tensions
Tensions, as a core concept of paradox theory, involve conflicting but interdependent elements, values, or objectives (Cameron & Quinn, 1988). The paradoxicality of tension is determined by opposition, interdependence, and persistence (Carmine & De Marchi, 2022; Smith & Lewis, 2011). On an organizational level, paradoxical tensions can be understood as undecidable trade-offs (Berti & Pina e Cunha, 2023). Paradox theory is explained in detail in section 2.2, and the concept of tension forms the core of essays 2 and 3.

Sensemaking and cognitive frames
Sensemaking is the process through which individuals give meaning to experiences, and it involves interpreting and constructing an understanding of the world (Weick, 1995). In this thesis, sensemaking is an underlying concept for cognitive frames (CF). A CF is a "mental template that individuals impose on an information environment to give it form and meaning" (Walsh, 1995, p. 281). It is in this thesis discussed as a means for dealing with complexity and ambiguity (Hodgkinson & Healey, 2008; Walsh, 1995). These concepts are further discussed in section 2.2.3 and essay 1.

Power
The understanding of power in this thesis follows the understanding of power as described by Foucault, where power is present in any social interaction as a force that compels any actor to do something, thus present in any societal or relational interaction (Lynch, 2010). More discussion on power can be found in section 2.2.5 and essay 3.

Last Mile Delivery (LMD)
In this thesis, LMD refers to the final stage of the supply chain, where an order is delivered to the end customer (Lim et al., 2018) from fulfillment to delivery. LMD can be both urban and non-urban. The thesis acknowledges that last mile logistics and last mile distribution are often used synonymously with LMD in literature, and the thesis does not distinguish between last mile delivery, last mile logistics, and last mile distribution, perceiving them as essentially synonymous. Last mile literature and the converging concepts of LMD and city logistics are reviewed and discussed in section 2.3. LMD is used in essays 1 and 2 as a concept covering urban and non-urban deliveries.

City Logistics
This thesis discusses city logistics as all the services provided to transport goods and fulfil the logistics needs of various stakeholders within a city or urban area (Dablanc, 2007). Section 2.3 elaborates on the city logistics concept and literature, which forms the empirical context of Essay 3.

E-grocery retail
E-grocery retail is a segment of food e-commerce that encompasses ready-made meals delivered on demand, grocery items, and enogastronomic e-commerce, which includes non-perishable products with non-critical delivery times.(Seghezzi et al., 2022). In this thesis, the term e-grocery refers to any grocery shopping conducted by a consumer through an app, platform, or online, with the groceries delivered to a chosen location (such as a home, a parcel locker, or a pick-up point), irrespective of the delivery time. E-grocery delivery is the empirical context of Essay 2 in this thesis.

Sustainability

Sustainability will be discussed in the context of last mile delivery and city logistics. Emphasis is placed on sustainability's social and environmental aspects, with all they encompass in terms of overlapping societal implications while acknowledging the economic realities organizations face. This understanding recognizes the paradoxical and sometimes fuzzy understanding the word sustainability entails, and a discussion on sustainability follows through the thesis. More discussion on sustainability can be found in sections 2.1 and 2.5.

2. POSITIONING IN LITERATURE AND THEORY

This section gives an overview of the literature and research this thesis is based on and contributes to. The sections below illustrate the landscape in which this research is set and give an overview of the theoretical positioning. The section starts with an overview of logistics in sustainable supply chain research and introduces paradox theory, the central theory of the thesis. Theory is presented first to provide the reader with an understanding of the key paradox theory concepts. After this, literature on the empirical contexts of last mile delivery and city logistics is reviewed.

2.1 Sustainability research in logistics and supply chains

Research in most management areas has started paying attention to the growing concern for climate change, biodiversity loss, and other environmental challenges. In addition, our global world makes us increasingly aware of the manifold social challenges that are involved and need to be solved alongside environmental issues. Thus, sustainability is and should be present in any area of supply chain research.

The interpretations of sustainability in supply chains vary (Seuring & Müller, 2008), as the research is cross-disciplinary by nature and connected across research fields (Quarshie et al., 2016). This is both a challenge and an opportunity, as there are many angles to pursue. Sustainability in the context of supply chain management can be understood from different perspectives. For example, Montabon et al. (2016) present the ecologically dominant logic to understand sustainability, whereas Carter & Rogers (2008) look at sustainability from a traditional triple-bottom-line perspective. The triple-bottom-line approach has helped operationalize sustainability as a concept (Seuring & Müller, 2008) and has, in many ways, become synonymous with sustainability (Montabon et al., 2016). A decade ago, Pagell and Shevchenko (2014) noted the limitations of our knowledge of the radical changes needed to create truly sustainable supply chains. The ecologically dominant logic, as described by Montabon et al. (2016), addressed this concern and concluded that the traditional triple-bottom-line approach to sustainability, where social, environmental, and economic sustainability is equal, needs to be revised so that economic and social sustainability is understood as dependent on environmental sustainability, as society and human activity exists within the realm of environment. The difference between these perspectives can be viewed as an instrumental and integrative logic of sustainability (Gao & Bansal, 2013). According to Gao & Bansal (2013), research often assumes instrumental reasons for investments in environmental and social sustainability, which leads to the causal relationship between sustainability investments and company performance. This means that instrumental logic creates tension between business and society. Sustainability as a concept is based on a systems perspective, and an integrative approach to sustainability might be more fruitful when economic prosperity, environmental integrity, and social equity are viewed as interconnected (Gao & Bansal, 2013). The sustainability interpretations of Carter & Rogers (2008) follow the dominant paradigm of business that is instrumental and anthropocentric, placing humans in the middle of a system where elements can be controlled and isolated, creating a focus on technology and engineering (Gao & Bansal, 2013). This ties the instrumental perspective to schools of thought like ecological

modernization theory, which prescribes innovation as the tool to reach sustainability (York & Rosa, 2003). On the other hand, the ecologically dominant logic follows a sustainability paradigm focusing on a system of interdependence and connectedness, described as integrative. A tighter integration of sustainability brings challenges that have given rise to new theories for exploring sustainability.

"*A paradox perspective on corporate sustainability explicitly acknowledges tensions among different desirable, yet interdependent and, at times, conflicting sustainability objectives such as environmental protection and social well-being.*" (Hahn et al., 2018:235)

No perspectives mentioned are mutually exclusive, as all create tensions between what is deemed essential and valuable. Thus, the perspective of paradox has entered sustainability research, offering arguments that acknowledge the tensions and conflicts between sustainability objectives to enable better decision-making (cf. Hahn et al., 2015, 2018). As complexity and contradictory demands grow in contemporary global organizations, there is an increasing interest amongst researchers to adopt a paradox lens to understand tensions (Smith & Lewis, 2011). Decision-making in any sustainable supply chain setting involves much uncertainty and many tradeoffs (Carter et al., 2020). A paradox perspective will argue that meeting multiple divergent demands is a requirement to gain long-term sustainability (Smith & Lewis, 2011).

None of the perspectives presented have been developed in isolation but informed by society and organizations. Therefore, they are naturally linked when empirical studies inform theory (Corley & Gioia, 2011). The different perspectives on sustainability also influence one another as they function as a way of contrasting differences. In uprooting instrumental understandings of sustainability, theory can be used to unsettle taken-for-granted assumptions on sustainability (Pflueger et al., 2024). Thus, using paradox theory provides opportunities for perspectival theorizing (Cornelissen et al., 2021) in the supply chain research field dominated by instrumental and positivistic perspectives that have left space for socially constructed approaches (Gammelgaard, 2004, 2023). That is why this thesis has used paradox theory to explore sustainability in the context of LMD and city logistics. The following sections will present paradox theory.

2.2 Paradox theory

This section overviews paradox theory and its usefulness for exploring sustainability-related questions. It also outlines the theory's core concepts and their use in this thesis.

2.1.1 Tensions at the core of paradox

Tensions have been described as values or objectives that seem to conflict or contrast with each other but are interdependent (Cameron & Quinn, 1988). Tensions are the concept that forms the core of paradox theory, as there is a persistent cyclical relationship between the opposing elements that create tension (Bednarek & Smith, 2023; Cunha & Putnam, 2019; Lewis, 2000; Schad et al., 2016). A paradoxical tension is "contradictory yet interrelated elements that exist simultaneously and persist over time" (Smith and Lewis, 2011, p. 387). Thus, opposition, interdependence, and persistence create a

paradoxical tension (Carmine & De Marchi, 2022). The use case for paradox theory in research is the ability to explore complex and ambiguous environments (Lewis, 2000) or any situation involving oppositional forces that seem to make sense in isolation but create contradiction (Fayezi, 2022). In an organizational context, tension can be exemplified as mixed messages that occur through language and communication or systemic tensions between centralized and decentralized (Lewis & Smith, 2014). The primary focus in paradox research has been on the organizational level. Organizations face constant tensions that can be organized following the categories of learning, belonging, organizing, and performing and the intersections of these categories (Smith & Lewis, 2011). However, tensions can exist on all levels, from individual and organizational to systemic (Carmine & De Marchi, 2022; Hahn et al., 2015). The tension concept in paradox theory is illustrated in Figure 1.

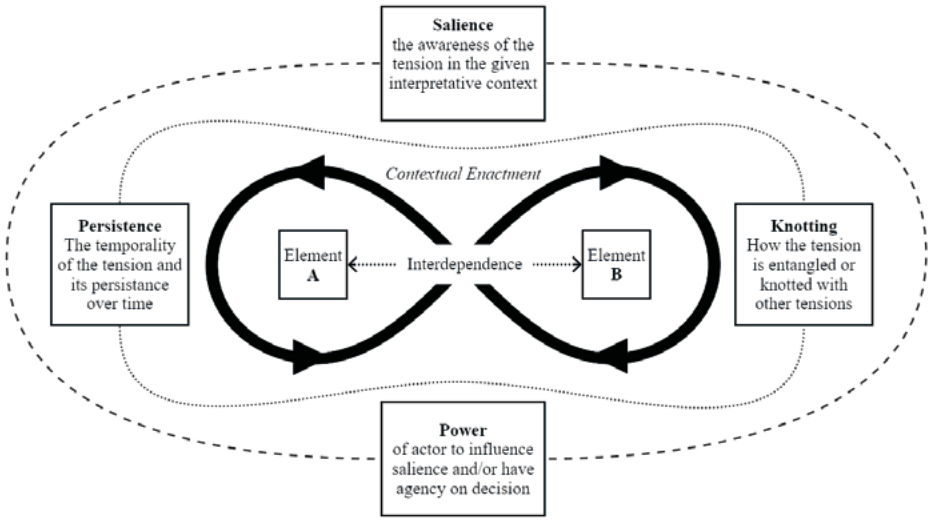

Figure 1 The paradoxical tension concept

Recently, conceptual development has been done within paradox theory. One example is Berti and Pina e Cunha (2023), who have, in their double-loop model, elaborated further on what constitutes paradox in tension and described tensions as undecidable trade-offs. The double-loop model enriches the paradox perspective with the dialectics of contradiction and emphasizes the dynamic nature of tensions, where the elements that make up paradoxical tensions are relational and not static (Bednarek & Smith, 2023; Berti & Pina e Cunha, 2023). This means that the relationship between two opposing elements in tension is a process in which not just the relationship between the elements can change but also the elements themselves (Hargrave, 2021). This perspective provides the understanding of a dialectical transformation where a new synthesis, a radical shift in the frame of reference that alters the tension landscape, is reached through conflict (Berti & Pina e Cunha, 2023). However, transformation requires a generative paradox, which stimulates new perspectives and actions through innovation, adaptation, or learning. This contrasts with pathological paradoxes, dysfunctional situations caused by

non-productive responses to tension (Berti & Pina e Cunha, 2023). This aligns with the idea that paradox theory is helpful in complex environments. Moving beyond either/or thinking to embrace both/and paradoxical thinking can create synergies and new possibilities (Lewis and Smith, 2014). Ideally, organizations that can tap into the power of paradoxes can enable change and creativity (Lewis, 2000). High-performing teams and organizations apply a combination of strategies that adhere to paradoxes (Lewis & Smith, 2014) and present "both/and" leadership (Smith et al., 2016). However, tension responses are often unproductive and can lead to vicious cycles and pathological paradoxes. These responses are described by Lewis (2000) as splitting the tensions, projecting the conflicting attributes, repressing or ignoring tensions, regressing to a state when the tensions were not present, reactions to reinforce the feeling opposing the tensions, or using ambivalence to create distance from the tension.

It is essential to consider the factors influencing tensions to understand what leads to generative or pathological paradoxes. For paradoxes to have generative potential, they must be salient, bringing about the fundamental concepts of latency and salience. Salience is described as tensions that are articulated and observed as they are experienced (Lewis, 2000; Smith & Lewis, 2011), while latency refers to a not-manifested paradox with an unspecified probability that an actor will experience in a specific situation (Moschko et al., 2023). Salience is also contextually enacted, meaning that paradoxes are not preexisting but emerge through contextual enactment that makes the salient paradox a situational choice (Hahn & Knight, 2021). Leaders who have adopted a paradoxical mindset can increase the salience of paradoxical tensions (Knight & Paroutis, 2017), but leaders can also strive to conceal paradoxes (Schneckenberg et al., 2023). In worst-case scenarios, the lack of paradoxical thinking can lead to myopia, unethical behavior, or even chaos, while adopting paradoxical thinking within an organization can boost creativity, enhance resilience, and lead to both short- and long-term success (Fayezi, 2022). There is much research indicating that organizations use defensive strategies to deal with paradoxes (Schrage & Rasche, 2022). Thus, achieving salience is not enough to balance a paradox (Knight & Paroutis, 2017). In addition to salience, power is also a key factor, as there needs to be an empowered actor that has leverage and agency in situations to make tensions salient or influence their handling (Berti & Pina e Cunha, 2023).

Research has shown that tensions evolve as managers alternate between actively acknowledging and working with tensions and defensively circumventing or ignoring them, adding complexity to the concept (Jarzabkowski et al., 2013). This can lead to situations where organizations repeat cycles where tensions become increasingly entangled at all system levels as the organization tries to maintain equilibrium in the face of paradoxical instability (Jarzabkowski et al., 2022). As Sparr et al. (2022) outline, paradox theory holds much potential and is evolving from being used as a label (Scott Poole Andrew Van De Ven, 1989) to a lens for understanding a shift in underlying assumptions (Lewis, 2000), and an applied theory with clear boundary conditions, like the seminal work of Smith and Lewis (2011). There are notions of how paradox theory could be evolving into exploring "more-than" paradox and span levels, phenomena, and time as a meta-theory (Putnam et al., 2016; Schad et al., 2016; Sparr et al., 2022), but in the realm of logistics and supply chain most paradox research remains descriptive and

lacks deep considerations of paradoxicality and elaboration of tension dynamics (J. Zhang et al., 2021).

2.1.2 Paradox theory and sustainability

In sustainability research, paradoxes have been investigated in three ways: through the detection of paradoxical tension, using sensemaking to understand paradoxical frames or thinking, and analyzing responses, i.e., paradoxical actions and strategies (Carmine & De Marchi, 2022). Paradoxical tensions are a well-suited tool for analyzing sustainability-related matters (Mazutis et al., 2021; Slawinski et al., 2017). Paradoxical tensions can challenge the dominating instrumental understanding of sustainability (Hahn et al., 2018) and can be helpful to inform ethical decision-making when businesses face sustainability tensions (Carmine & De Marchi, 2022). However, sustainability tensions are often put into the background by companies who do not acknowledge the importance of such tensions and instead focus on financial goals (Sitong, 2022). Tensions are a natural part of dealing with multiple triggers (Seuring & Müller, 2008), such as sustainability. Sustainability is also a multi-level phenomenon that brings in its source of tension on and between individual, organizational, and system levels (Hahn et al., 2015). Still, many companies deal with sustainability tensions by compartmentalizing them or through temporal splitting and, for example, including sustainability considerations only for certain parts of their supply chains (Jay et al., 2017). To further research using a paradox perspective Hahn et al. (2018) have identified the perspective's interconnected normative, descriptive, and instrumental aspects. These three factors are interlinked and influence each other. Normative factors explain how societal norms impact whether sustainability is seen as an intrinsic value or not, descriptive factors explain how organizations and individuals respond to sustainability tensions, and instrumental factors explain the connections between tensions and sustainability outcomes (Hahn et al., 2018). In addition to this, the level, the change, and the context need to be considered when tensions in sustainability are to be researched, as these specify the tensions between the elements of economic, environmental, and social aspects of sustainability (Hahn et al., 2015). Also, the temporal aspect (short vs. long term), as well as the level of analysis (whole system vs. part of system), are very relevant in the societal analysis of tensions (Jay et al., 2017).

2.1.3 Cognitive frames and the sensemaking of paradox

Cognitive frames (CFs) give managers a structure for their assumptions and boundaries for what to include in their sensemaking when performing tasks in different situations (Smith & Tushman, 2005). Sensemaking is constructing meaning on an individual or group level (Weick, 1995). CFs are part of sensemaking and refer to “a mental template that individuals impose on an information environment to give it form and meaning” (Walsh, 1995, p. 281). Decision-making evaluates alternative courses of action, while sensemaking is concerned with making things that have already happened meaningful (Boland, 2008). Decisions are often viewed as rational processes, and the sensemaking end of the decision-making process spectrum is frequently neglected (Ericson, 2010). Decision-making usually starts with a problem and ends with a solution (Weick, 1995), but decision-making is also entwined with sensemaking as an underlying dynamic

(Boland, 2008; Ericson, 2010). Sensemaking and decision-making work in tandem, as decision-making relies on continuous sensemaking. Sensemaking provides the retrospective reflexive context and foundation for decision-making, and decision-making gives the direction and purpose necessary for navigating and making choices (Boland, 2008). Thus, sensemaking and decision-making are connected in the manager as an actor (Boland, 2008; Choo, 2002). That is why a broader view of sense needs to be included in strategic decision-making (Ericson, 2010). In managerial sensemaking literature, CFs have become a tool for understanding managerial inference (J. P. Cornelissen & Werner, 2014).

Building on previous work (cf. Hahn et al., 2014; Suedfeld and Tetlock, 1977), Preuss and Fearne (2022) have conceptualized three managerial frames regarding sustainability: a unidimensional, a hierarchical, and a paradoxical frame. The unidimensional "business case" frame is very profoundly rooted among managers (Menon, 2022) and sensebreaking is needed to transform a unidimensional "business case" frame (Giuliani et al., 2021; Menon, 2022). Managers remain essential stakeholders and can have a significant impact on the sustainability practices of organizations (Prataviera et al., 2023). Hierarchical sustainability frames hold more content, but the logic is structured in a way so that sustainability is considered if it can provide economic benefit (Preuss & Fearne, 2022). A paradoxical frame, on the other hand, allows for both/and thinking and promotes the recognition and processing of simultaneously existing and seemingly contradictory elements and can be beneficial for creativity and innovation (Miron-Spektor et al., 2022). For sustainability, this means winder and more inclusive considerations of different facets of sustainability. But there is a need to understand what the paradoxical frame would mean in a specific context to guide sensemaking (Menon, 2022). In essay 1, CFs are used as a lens and analytical tool to start discerning underlying sensemaking in how managers speak about operational events and decisions regarding sustainability and how they think about sustainability in the context of the last mile.

2.1.4 Power and paradox

Management literature has mainly looked at power to prevent conflict and preserve interests or overlooked it as a concept, even if it is embedded in everyday life and needs investigation to benefit both businesses and society (Hardy & Clegg, 2006). Power dynamics are essential to understanding the responses and outcomes of tensions. The pathological paradox stems from a lack of agency or resources that traps actors in a vicious cycle of irrationality (Berti & Pina e Cunha, 2023). Thus, power becomes a crucial element to consider as actors should take different strategies to manage contradictions when the distribution of systemic power is stable and symmetrical and when it is unstable or asymmetrical (Hargrave & Van de Ven, 2017). So far, paradox research has focused on an assumed symmetrical power distribution, even if the virtuous cycles of acceptance and adjustment are not feasible if only one actor enjoys power (Hargrave & Van de Ven, 2017). Thus, understanding power, politics, and the broader institutional context is essential for elaborating on and understanding tension dynamics (Bednarek & Smith, 2023). It is important that an empowered actor can make tensions salient and impact whether there is a response to paradox, shaping a strategy to cope with it (Berti

& Pina e Cunha, 2023). This paves the way for discussions where the desires and wants of each actor within the broader context of the situation become emphasized (Bednarek & Smith, 2023). Still, the inclusion of power perspectives and elaboration of the power concept in paradox theory need to be explored.

This thesis uses power as a concept in paradox theory in essays 2 and 3. Where essay 2 discusses power dynamics on a systems level and their impact on sustainability in e-grocery delivery, paper three uses the types of power as presented by Hardy (1996) to understand tension responses in the development of sustainable city logistics. In their framework Hardy (1996) elaborates Lukes (1974) three dimensions of power from a strategy research perspective. Lukes (1974) describes power through three dimensions: the first dimension focuses on the direct and visible use of power in observable conflict, the second dimension includes the ability to control agendas or control through limiting the scope of decision-making, and the third dimension shapes people's perceptions, cognition, or preferences. In Hardy's framework (1996), these dimensions are the power of resource, process, and meaning. Here, power as a concept is seen as energy for strategic change, and the multidimensionality of power is acknowledged (Hardy, 1996; Lynch, 2010). The framework emphasizes the use of different types of power to bring about strategic change, thus providing a good fit with the context of developing sustainable city logistics solutions. The power of resources refers to activities of, for example, rewarding or coercing; process power refers to, for example, decision-making processes and the creating of awareness, whereas the power of meaning includes values, symbols, and rituals (Hardy, 1996). As a backdrop to all organizational activities Hardy (1996) places the power of the system following the thinking of Foucault. The power of the system functions as embedded and taken for granted, emphasizing the fact that where there is power, there is resistance that can change the system (Lynch, 2010). Still, Foucault also emphasized how individuals are limited in resisting and transforming the system (Hardy & Clegg, 2006). Hardy (1996) argues that managers and other organizational actors have some power embedded in their organizations and roles, and even if this might not lead to transformational change on a systems level, it can be utilized for bringing about change through using the power of resources, process, and meaning. It is against the backdrop of systems power that organizations must use the dimensions of meaning, process, and resource if they want to bring change (Hardy, 1996).

2.1.5 The use of paradox theory in this thesis

Paradox theory in a supply chain setting could be utilized to investigate the tensions that arise from shifts or transformations in services, processes, or systems (Fayezi, 2022). Thus, the dynamic and transforming last mile and city logistics landscape provides ample opportunities for investigating tensions and paradoxes. As outlined above, paradox theory also provides a means towards a more nuanced investigation of sustainability, and it needs more investigation at both levels and power dynamics.

A conceptual framework is useful for making sense of empirical data and guiding the researcher (Miles & Huberman, 1994). In this thesis, each article has its own theoretical framework that explores and focuses on some essential parts of paradox theory. The focus of each essay and the use of paradox theory are presented in Figure 2. The

description of the use of paradox theory is inspired by the categorization of Carmine and De Marchi (2022), who, in their review of paradox theory use, conclude that a significant part of paradox research is done through the detection of tensions, mainly on the organizational level, followed by sensemaking perspectives on individual levels, and looking into responses to tensions. In this thesis, essay 1 uses cognitive frames (Hahn et al., 2014; Preuss & Fearne, 2022) to examine individual managerial sensemaking of sustainability in LMD. Essay 2 detects and theorizes tensions on individual, organizational, and systems levels in e-grocery delivery. Essay 3 explores a city logistics context and combines paradox theory with the types of power described by (Hardy, 1996) to discuss and contribute to understanding the city's role in developing sustainable city logistics.

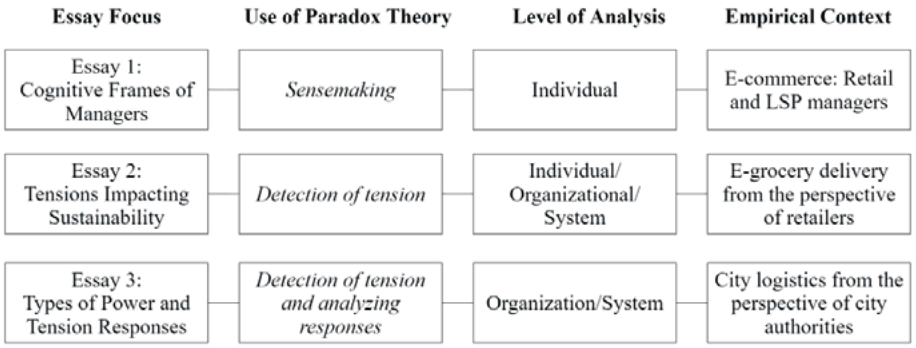

Figure 2 The use of paradox theory in the essays

The following sections review the literature on LMD, city logistics, and sustainability to situate the thesis research in the empirical contexts where the paradox exploration occurs.

City logistics and last mile delivery as converging literature streams

This section introduces the concepts of last mile delivery (LMD) and city logistics and discusses their use in literature, occurring synonyms, and their convergence as research streams. This discussion is added to clarify the concepts used and provide an overview of the research streams this thesis builds from and contributes to.

Last mile delivery (LMD) is a crucial success factor and a significant challenge for retailers who try to keep their customers happy and satisfied. In this thesis, LMD refers to the final stage of the supply chain, where an order is delivered to the end customer (Lim et al., 2018), including the process from fulfillment to delivery. To ensure consistency, the term LMD is used throughout the thesis. However, it must be noted that, for example, Olsson et al. (2019) suggest a framework where last mile logistics is an umbrella term for last mile distribution, which contains *last mile fulfillment*, *last mile transport*, and *last mile delivery*. While this framework adequately describes the different parts involved in the last mile process, it is essential to note that these last mile terms are often used synonymously in literature. Where Olsson et al. (2019) divide last

mile distribution into fulfillment, transport, and delivery, noting a back end and a customer-facing front end of the process, other research such as Ekren et al. (2024) van Duin et al. (2024) include the whole process starting from up until final delivery when they use the term LMD. There are also discussions regarding the urban vs. rural component of the last mile, where Boysen et al. (2021) describe LMD as "all logistics activities related to the delivery of shipments to private customer households in urban areas." Still, for example, Vakulenko et al. (2022) distinguish between deliveries made to urban vs. rural areas, noting that all of them have a "last mile." LMD is used in essays 1 and 2 as a concept covering urban and non-urban deliveries.

City logistics concerns urban freight movements and logistics services for various stakeholders, such as urban LMDs. From an academic research perspective, city logistics is a relatively new topic, with more attention on the subject in the past 20 years (Browne et al., 2018). The terms city logistics and urban logistics are often used synonymously. This can be seen in for example Correia et al. (2024), who explicitly refer to the terms as synonyms in their article. Included in city logistics is often the term urban freight or urban freight systems, which is sometimes also used synonymously with city logistics (Taniguchi et al., 2016). Sometimes, the term urban logistics is used to refer to logistics problems in a city (Büyüközkan & Ilıcak, 2022). Here, urban space and urbanization are the common dominators for discussing logistics activities. This thesis adopts a broad use of the term city logistics as all the services provided to transport goods and fulfill the logistics needs of various stakeholders within a city or urban area (Dablanc, 2007, 2019). Empirical data and discussions with respondents partly lead to this broad definition and incorporate the full scale of logistics activities in a city, focusing on commercial activities. Thus, distinguishing city logistics from urban LMD is the inclusion of a variety of logistics activities within the physical space of a city. An alternative would have been to use the term *urban freight transport*. However, city logistics contains a broader scope than the movement or transport of goods. It covers the entire logistics system in a city, including transport routes and infrastructure, warehousing locations, and different stakeholder perspectives, policies, and planning; here, using urban freight would have indicated a more narrow scope than is done in Essay 3.

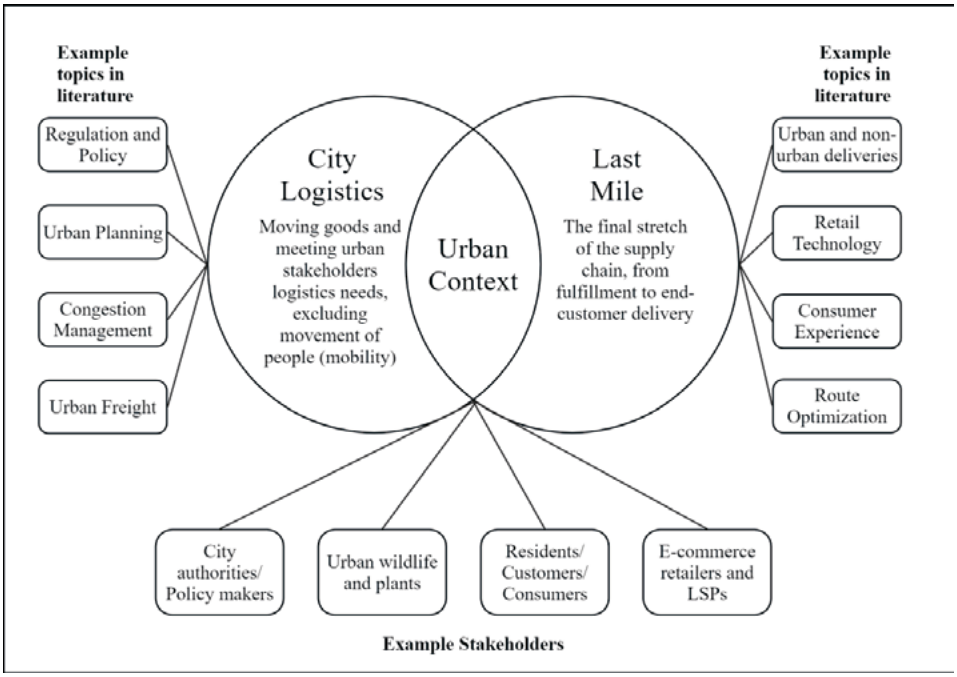

Figure 3 The converging literature streams in last mile delivery and city logistics research

As the illustrative Figure 3 shows, the two literature streams of city logistics and LMD are related and partly overlapping. Still, a few distinctions could be made to illustrate the different nature of research within them. Last mile literature typically, but not always, takes the perspective of companies or their end customers as a lens, and common topics related to route optimization (cf. Salama & Srinivas, 2020; Simoni et al., 2020), customer experience or service (cf. Olsson et al., 2022; Vakulenko et al., 2019), and other e-commerce or retail-related questions (cf. Lagin et al., 2022; Zhang et al., 2019). As noted above, LMDs do not always happen in a city or urban space but can be delivered to non-urban areas, even if urban last mile deliveries are more frequently researched and the last mile is most understood as an urban activity. For example, Correia et al. (2024) use the term "last mile urban logistics" and discuss the barriers policymakers face when responding to citizen needs and serving their communities. This illustrates how LMD is connected to stakeholder perspectives often discussed in city logistics literature.

City logistics literature, on the other hand, often take city decision-maker perspectives and involves, for example, policy research (cf. Lebeau et al., 2018), regulation (cf. Fontaine et al., 2023), and urban planning (cf. Kin & Quak, 2024; Taniguchi & Thompson, 2018), perspectives not too common within last mile delivery research. However, several touchpoints between these literature streams make them naturally connect and converge. Most LMDs happen within cities, and their impact on urban spaces and logistics systems is profound (Correia et al., 2022). Cities are also interested in understanding and being part of shaping sustainability efforts and pushing, for example, retailers and LSPs towards more sustainable options by creating, for instance, zero-emission zones (Motloung et al., 2024) or trying to instigate collaboration with the

different stakeholders (Arvianto et al., 2021; Lindholm & Browne, 2013; Taniguchi et al., 2024). Another example of the overlap between the two literature streams can be seen in Cheba et al. (2021) article that looks at factors that could impact sustainable e-commerce development in cities and recognizes internet access, macroeconomic conditions, and social aspects as factors influencing e-commerce activities in cities and the following environmental impact of them. Another example is the readiness of city traffic environments and how socially accepted delivery robots are (Arntz et al., 2023). As these examples illustrate, the urban context and the city logistics system are essential factors for LMD and vice versa.

As these two literature streams converge in this thesis, it is notable that there are no clear-cut boundaries when it comes to research in either area. Both areas of inquiry have perspectives to provide for each other. Thus, their convergence in this thesis allows for blending perspectives that can contribute to rich research insights. Sustainability seems to be one of the unifying factors. When dealing with questions regarding sustainability in both LMD and city logistics, a wide range of stakeholders and issues need to be considered, including, for example, the urban environment, society, and residents. Where the research streams diverge, they can also complement and enrich each other, so a less strict division might not be helpful in exploratory research. The following sections will discuss stakeholders and sustainability as both factors unify many LMD and city logistics concerns.

2.4 City logistics and last mile delivery stakeholders

Both city logistics and LMD have several stakeholders, such as the city residents, the consumers or users of delivery service, the retailers that ship their products using logistics service providers, companies that need deliveries to operate their business, and the city authorities who need to keep the city running smoothly and take care of the interests of residents and companies alike. Stakeholder questions have been addressed by numerous authors and from different perspectives in both LMD (cf. Garus et al., 2022; Ghaderi et al., 2022; Isa et al., 2021; Kiba-Janiak et al., 2021; Olsson et al., 2022; Tolentino-Zondervan et al., 2021) and city logistics research (cf. Ballantyne et al., 2013; Dablanc, 2007; Estrada & Roca-Riu, 2017; Gammelgaard, 2015; Kiba-Janiak, 2016; Lindholm & Browne, 2013; Macharis et al., 2014; Macharis & Milan, 2015; Rześny-Cieplińska et al., 2021; Taniguchi, 2014; Taniguci & Thompson R.G., 2018; Zenezini et al., 2018).

Many of the same stakeholders are involved in both city logistics and LMD research but from slightly different perspectives. For example, in city logistics, humans could be seen as representing a citizen or a resident of an urban area (Correia et al., 2024), whereas that person in LMD literature could be viewed through the lens of their consumption or customer experience in e-commerce (cf. Kiba-Janiak et al., 2024; Olsson et al., 2022; Vakulenko et al., 2018). If, for example, social sustainability is discussed, the safety of an individual customer picking up their parcel (De Oliveira et al., 2019) could represent LMD, and in city logistics, the question might concern traffic safety and the safety of residents with increased use of autonomous delivery vehicles (Garus et al., 2022). For example, Macharis et al. (2014) propose a multi-actor multi-criteria analysis framework

for ensuring successful city logistics development where the stakeholders in transport markets, public space, and the traffic market are included. This means that both shippers and receivers of goods, citizens and public authorities, and logistics service providers (LSPs) must be included in planning and decision-making to ensure success. This is essential because short-term solutions are valued when public and private stakeholders cooperate on urban freight-related projects. Still, long-term relationships and mutual understanding are equally crucial, particularly for policy input (Lindholm & Browne, 2013). Thus, including stakeholder perspectives is essential. Even as perspectives overlap, they showcase the need for various research perspectives within LMD and city logistics. In the three essays in this thesis, the primary focus is on three different stakeholders, namely e-commerce retailers and LSPs (essay 1), E-grocery retailers (essay 2), and city authorities (essay 3). The focus on only three stakeholders was made to provide depth in each essay. Future research could look closer into the same topic areas and provide deeper insights from, for example, resident or customer perspectives.

Retailers and LSPs are core actors when discussing LMDs as they are the main actors executing LMDs. That is why e-commerce retail and LSP managers are the focal points of the analysis in Essay 1, and e-grocery retailers provide the data for Essay 2. The importance of LMDs for retailers and LSPs can be illustrated by pointing out that LMDs can account for up to 50% of the total supply chain costs (Kuhn & Sternbeck, 2013) and is estimated to represent about 40% of the generated supply chain emissions (Pourrahmani & Jaller, 2021). Both retailers and LSPs have become more interested in sustainability questions, but their interests and goals might not align with each other's. As outlined above, LMDs are expensive, and there is a need to focus on efficient execution, which has traditionally been the focus of LSPs, who primarily have not engaged deeply in questions of environmental sustainability (Kiba-Janiak et al., 2021). Retailers, on the other hand, have mostly outsourced the sustainability of logistics activities to their LSP partners, especially as more pressing operational concerns take priority (Huge-Brodin et al., 2020). In addition to this, several organizational, financial, collaboration, technological, and regulation-related barriers remain to the adoption of sustainability practices (Sallnäs & Björklund, 2023). This is why further research is needed to explore retail and LSPs and their relation to sustainable LMDs.

2.5 Sustainability in last mile delivery and city logistics

A multitude of sustainability challenges are present in both LMD and city logistics. Some examples include congestion, noise, and emissions (Lindholm & Blinge, 2014), biodiversity concerns (Sandström & Elander, 2021), traffic safety issues (Garus et al., 2022), health concerns (Browne et al., 2012), and questionable working conditions (Moncef & Monnet Dupuy, 2021). Many aspects overlap and have an overreaching impact on society in general. For example, emissions and pollution impact nature and global warming but also cause health issues (Browne et al., 2012). Similarly, customers are also city residents, and their safety and health are of social importance as they are of concern for the companies whose customers they are. Figure 4 represents a visual summary of sustainability aspects discussed in LMD and city logistics literature, visualized by the integrative logic of Montabon et al. (2016). Acknowledging that the triple-bottom-line, presenting economic, social, and environmental sustainability, is the

prevailing approach in research, the integrative logic wants to highlight the circumstances of economic success depends on a functioning and well-being society in a liveable and thriving environment. The aspects illustrated in Figure 4 function as examples and do not represent a complete list of factors that could be included, as we constantly learn of more concerns to include. This thesis aims not to investigate or reduce sustainability to any particular aspect visible in Figure 4 but to explore framing, tensions, and responses to tension within this context and elaborate on their impact on and meaning for investigating sustainability.

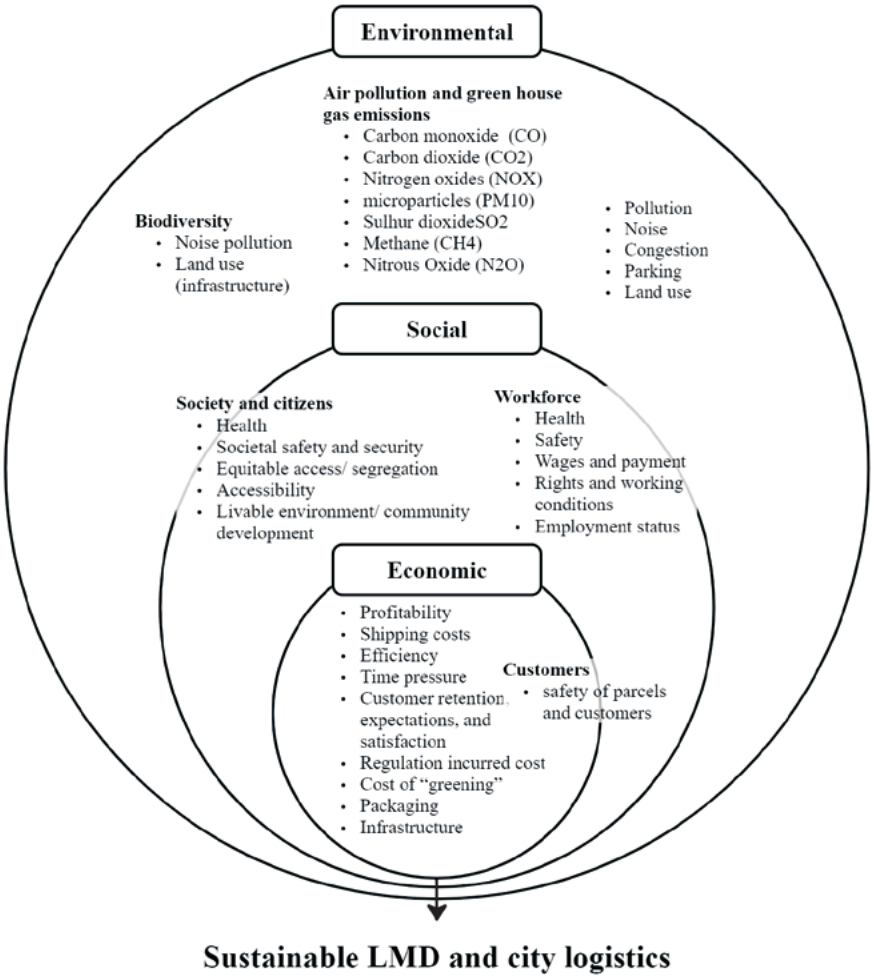

Figure 4 A visual summary of sustainability aspects involved in sustainable LMD and city logistics

Sustainability in LMD remains hard to implement due to several challenges. As outlined in the introduction, the LMD landscape is in transition amid growing concerns for sustainability. From an economic perspective, factors like failed deliveries, customer

density, and high personnel costs drive up last mile expenses, (Mangiaracina et al., 2019). Customer expectations become more demanding when industry giants like Amazon add pressure for free delivery (Dolan, 2018). Small companies find it particularly challenging not to offer free deliveries, but strategies such as bundling shipping costs, setting purchase minimums, or offering subscription-based models with perks can mitigate this (Ketchen & Craighead, 2020). This means that profitability remains elusive, especially for services like e-grocery delivery (Wollenburg et al., 2018). Alternative delivery methods that don't require the customer to be at home could reduce costs (Boysen et al., 2021). Such solution, that reduce cost and improve efficiency could include pick-up points, drones, trunk delivery, and crowdsourced logistics (Mangiaracina et al., 2019). In addition to this also, for example, infrastructure and operating different vehicle types have an impact on the economics of LMD (Nenni et al., 2019). These examples highlight why much of LMD research has focused on important questions such as optimization and efficiency of LMDs.

When looking at the environmental impact of LMDs the surge in on-demand deliveries strains fleets and increases pollution (Pani et al., 2020; Seghezzi et al., 2021), at the same time this effect is amplified by changing consumer habits (Villa & Monzón, 2021). The LMD has also been uncovered as the most inefficient part of the supply chain in terms of energy use (Halldórsson & Wehner, 2020). LMDs might also increase noise pollution affecting city residents (Garus et al., 2022) and effects can extend to harmful impact on urban biodiversity (Elander et al., 2005; Sandström & Elander, 2021). The social sustainability aspects of LMDs remain the least researched, but here it is notable that many environmental effects also have hazardous effects for human health (Browne et al., 2012). Accidents and other traffic incidents (Pourrahmani & Jaller, 2021) and questions of accessibility and safety (De Oliveira et al., 2019; Ménascé, 2014) should also be included in the social sustainability considerations.

While operational challenges in LMD are well-documented, sustainability research in this context has more ground to cover to explore the intricate nature, conflicts, and tensions created when all the aspects, exemplified in Figure 4, need to be considered. As the literature suggests, many, sometimes conflicting tensions impact sustainability in LMD, like balancing the efficiency and profitability goals with other sustainability considerations. Other tensions that have been revealed in previous retail and LMD literature include examples like when companies move closer to end consumers, there's an increase in green supply chain management practices, but the company's performance gains diminish, creating a position paradox (Schmidt et al., 2017) or when tensions in knowledge sharing between retailers and LSPs hinder the adoption of environmentally sustainable practices (Huge-Brodin et al., 2020). These tensions have not been explored through a paradox perspective, and even if sustainability research is gaining traction in LMD, the approaches seem mainly instrumental, focused on maintaining a sound business logic and economic sustainability. This thesis adds nuance to this discussion by theorizing LMD sustainability questions through a paradox lens to provide novel perspectives on how sustainability can be viewed and worked within this setting. This is important for understanding operational root causes and the decision-making that follows tensions.

One area where LMDs are particularly interesting due to the recent growth is e-grocery retail, the context of Essay 2. E-groceries are a part of food e-commerce (Seghezzi et al., 2022), and the e-grocery space is in transformation as apps and platform companies provide new marketplaces for e-groceries (Kronmueller et al., 2021). Many of the operational challenges of e-groceries, such as low margins inducing cost and optimization pressure (Seidel, 2021) or finding the optimal fulfillment solutions (Shapiro, 2022), are well-known in the literature. Still, new questions regarding sustainability keep emerging. For example, promoting autonomous delivery robots or unmanned drones could be one step toward lowering emissions of e-grocery deliveries (Figliozzi, 2020). Still, even if ordering food or groceries online might reduce the shopping trips for individual consumers, the overall increase in deliveries could harm the environment (Maltese et al., 2021). This is why further research is needed to understand how e-grocery deliveries impact sustainability.

City logistics takes place in the confined space of the urban environment. Still, city authorities have had a reactive mindset regarding urban freight and logistics services, not treating city logistics strategically (Browne et al., 2018). City logistics research emphasizes the importance of aligning internal processes to ensure effective functioning (Akgün et al., 2019; Fontaine et al., 2023; Gammelgaard, 2015; Kiba-Janiak et al., 2021), and there is a notable tension between long-term urban planning and short-term market developments in logistics (Kin et al., 2024). Logistics is also often overlooked in zoning and land use planning, especially regarding reducing externalities (Bjørgen & Ryghaug, 2022; Buldeo Rai et al., 2022). At the same time, E-commerce, startups, new omnichannel retail models, and the gig economy are driving innovations that significantly impact city logistics (Buldeo Rai et al., 2022). City characteristics influence which criteria are prioritized in logistics planning, with political and planning anchorage being crucial for private stakeholder participation (Bjørgen, Fossheim, et al., 2021) as incorporating freight considerations and engaging stakeholders from the outset of city planning is essential for creating efficient and sustainable city logistics systems (Bjørgen & Ryghaug, 2022). This means that from a strategic perspective, city planning and land use should be highlighted in city logistics planning (Kalliomäki et al., 2024).

The trend toward personalized delivery services and the increasing demand for speed are putting more pressure on cities, particularly if policymakers do not actively integrate solutions and foster collaborative efforts (Correia et al., 2022). With the rising concern for sustainability issues, cities need to incorporate logistics activities in their planning better (Kiba-Janiak et al., 2021). The many sustainability concerns presented above in Figure 4 are relevant for the whole city logistics space and, in many ways, shared concerns for urban LMDs. Logistics activities play a crucial role in the sustainable development of cities (Macharis et al., 2014) and the city plays a key role in providing measures and creating policies that support sustainable city logistics development (Paddeu et al., 2018). Consulting city logistics stakeholders should be at the core of these policies (Dablanc, 2023). Many city logistics solutions that have positive sustainability effects are first introduced to the urban space through pilots, meaning short-term test projects. However, pilots face several challenges such as requiring permits, finding the right location, and collaboration between city and company stakeholders (Ranjbari et al., 2023). Cities also balance the increasing need for delivery vehicles due to LMDs against

their wish to reduce traffic (Correia et al., 2022). The role of city authorities is not clearcut and there are a range of logistics measures and activities that cities can choose from, such as engaging in the facilitation of different kinds of urban consolidation centres (UCCs) (Johansson & Björklund, 2017; Taniguchi & Thompson, 2018).

Essay 1 explores how managers make sense of this complex environment and frame sustainability. Essay 2 delves into the tensions in an e-grocery delivery context that impact sustainability, and Essay 3 explores tensions, responses, and power use in sustainable city logistics development from the city's perspective.

3. RESEARCH PARADIGM AND METHODOLOGY

This section presents the research paradigm and methodology choices that underpin this thesis. It also describes the research process, methods, and quality measures used.

3.1 The ontology and epistemology of paradox research

Research paradigms are made up of the beliefs that guide a researcher in their research approach (Guba & Lincoln, 1994). A paradigm can also be called a philosophical perspective and includes the ontological end epistemological orientations of the research (Flint et al., 1998). Ontology is concerned with the assumptions about the nature of reality within the given research paradigm, and epistemology describes the ways of knowing and how knowledge is created (Guba & Lincoln, 1994).

The basic assumption in paradox theory is that paradox is socially or cognitively constructed polarities (Fayezi, 2022). Researchers have explored contradictions in organizations, applying paradox and dialectical perspectives. They are two different lenses with a shared philosophical history, where the paradox perspective has a focus on the ongoing management and coexistence with tensions, while the dialectical perspective emphasizes how tensions transform through conflict (Hargrave & Van de Ven, 2017). Paradox was in the late 80s introduced to management and organizational studies by Cameron & Quinn (1988) and Poole & Van de Ven (1989). It is important to note that paradoxes, as used in organizational studies, are not all strictly logical paradoxes that can exist in abstract thought, connected to the temporal and spatial constraints of the natural world (Poole & Van de Ven, 1989). According to the dialectical perspective, organizational contradictions (i.e., tensions) arise when actors socially construct contradictory relationships among and between the discursive and material elements of organizations (Putnam et al., 2016). The paradox perspective, on the other hand, sees paradox resolved through synergy, and the dialectics see contradictions (tensions) as addressed through politics and conflict (Hargrave & Van de Ven, 2017). On The individual level the role of sensemaking processes in addressing ambiguity and paradox within organizations (Weick, 1995), is underlining paradox theory. Essential is that paradox and dialectics perspectives are not necessarily mutually exclusive but consider different parts of a process and recognize various aspects of contradictions and the process by which contradictions play out (Hargrave & Van de Ven, 2017). This is a both/and viewpoint that paradox and dialectical processes are interdependent elements of a more extensive process (Hargrave & Van de Ven, 2017). Theoretically, combining the paradox and dialectical perspectives as Berti & Pina e Cunha (2023) have done in their double loop model, recognizes tensions (or contradictions) as socially situated and continuously changing (Hargrave, 2021). Berti and Pina e Cunha (2023) are adopting a contradictions perspective that encompasses both paradox and dialectics (Hargrave, 2021; Hargrave & Van de Ven, 2017) in their double-loop model.

Ontologically, this means that tensions or contradictions from discourse become part of material reality and are eventually seen as objective reality. They can manifest solely in discourse, in material circumstances, or through the interaction of both (Hargrave,

2021). This ontology could be described as constructivist, as in the ontological sense of construction, the discursive derives from some reality, and no clear boundary between the material and the symbolic world is perceived (Edley, 2001). This highlights the complex relationship between discourse, material reality, and the construction of knowledge. It suggests that contradictions or tensions are not isolated phenomena but integrated into the fabric of reality, shaping how individuals perceive and navigate the world (Hargrave, 2021). In a social constructivist sense, language in terms of verbalizing tensions is not reality, but it exists in a socially constructed reality (Edley, 2001).

Epistemologically paradox research is social constructivism, where individuals become conscious of contradictions when they encounter tensions between conflicting elements (Hargrave, 2021). In social constructionism, meaning is shaped and structured by social processes, making it susceptible to alterations within social contexts. This idea was introduced by Berger and Luckmann (1966) Their seminal book, “The Social Construction of Reality," discusses how society emerges from human agency and interaction. In social constructivism, knowledge is constructed of what there is a relative consensus about (Guba & Lincoln, 1994). This means social constructivism challenges the idea of objective reality and suggests that what we consider real and how we make decisions in science are not fixed or absolute but are influenced by our interpretations and perspectives (Kukla, 2013). Social constructivism fits well with studies in the urban context of this thesis, as the eclectic nature of urban studies and the wide variety of subjects that can be studied within it gives it no pre-defined ontological or epistemological stance (Harding & Blokland, 2014).

The dimensions and effects of current urbanization suggest a need for problematizing views and approaches to studying the urban environment and the activities within it (Barnett & Bridge, 2017). Thus, from a perspective of urban sociology, the relevance of culture and social construction can enable a richness in studies and allow for various types of inquiry (Harding & Blokland, 2014). The contradiction or tension in the urban research context itself is described by, for example Harding and Blokland (2014) who describe how research in an urban context can be seen both from the perspective of utopia, highlighting the potential of good life, or perspectives of pessimism, highlighting the issues and challenges in cities. This tension between utopia and pessimism illustrates the fit between the research context and paradox theory. In paradox theory, contradictions are dynamic and evolve over time (Hahn & Knight, 2021). By engaging with contradictions humbly and practically, researchers can gain insight into their complexities but need to have awareness and be adaptable to the research context (Hargrave, 2021), as has been done through this thesis's iterative and reflexive research approach. This means that the research is formed by narratives of individuals, organizations, and society regarding the work currently being done in LMD and city logistics. To reiterate from above, language exists in a socially constructed reality (Edley, 2001). The researchers involved brought this research to existence by theorizing paradox theory when exploring sustainability in LMD and city logistics. The following section on the research methodology explains how this process evolved.

3.2 Methodology

The three essays in this thesis all follow a qualitative methodology. This methodology was selected because it accepts the value of context, research setting, and a deeper understanding of phenomena (Marshall & Rossman, 2006). Qualitative research is also suitable for deriving meaning from patterns of systems, ideas, and themes (Patton, 2015). In the following section, the research approach, methodological choices, selection, and analysis, as well as quality measures, will be discussed.

3.2.1 Research approach

The research approach is the deliberate scientific reasoning that guides this thesis, which is presented in this section (Kovács & Spens, 2005). It could also be described as the approach to theory development through induction, deduction, or abduction (Saunders et al., 2015). The research approach functions as a roadmap and the method as the tool for conducting the exploration of the data (Marshall & Rossman, 2006). In induction, the inquiry starts from observations or specific instances that can then be generalized into theory through pattern recognition, while deduction begins with theory to then test it through experimentation and observation to either validate or refute the original theory (Saunders et al., 2015). Abduction, in turn, emphasized a more complex process where deviating observations are followed by interpretation and theory matching process that presents theory suggestions and applicable conclusions (Kovács & Spens, 2005).

The research in this thesis started with the initiation of a research plan based on an overarching problem statement that was derived from the researcher's existing theoretical knowledge and an unstructured review of the literature (Patton, 2015). The research problem was then iteratively refined throughout the thesis process, as is suitable for qualitative inquiry (Patton, 2015). After the initial planning of the research at the initial stages, several iterations of the research problem, questions, and analysis have been done throughout the work conducted with the three essays. This iterative process has included research seminar presentations, discussions with the thesis supervisors and other academics, data collection and conversations with industry representatives, PhD courses, and anonymous journal reviewer comments. These have all been part of constructing and re-iterating the research problem for both the thesis and the individual essays and could have been part of socially constructing the research into a suitable academic format. An overview of how the research has been organized can be found in Table 3.

Table 3 An overview of how the research was organized (adapted from Saunders et al., 2015)

Philosophy	Social constructivism
Approach to Theory Development	An iterative process with elements of induction and deduction and systematic combining
Method	Qualitative case study
Time horizon	Specific time segment, data collection autumn 2021 – spring 2024 (cross-sectional)

Constructivist inquiry has been described as a cycle where the researcher engages in an interpretive process with an open mind, not seeking absolute truth but maintaining a respectful distance from the symbolic communication of meaning (Marshall & Rossman, 2006). In this thesis, this process, illustrated in Figure 5, could be described as containing elements of induction and deduction at different stages of the research. In every essay, data analysis started with pre-coding the data inductively, trying to distinguish patterns and themes without imposing bias or structure through the theoretical framework. The theoretical concepts of paradox theory have been utilized deductively at a later stage, where the data has been viewed through a paradox lens to give it structure through cognitive frames in essay 1, tensions in essay 2, and tension responses and power types in essay 3. In this way, the process has resembled the systematic combining described by (Dubois & Gadde, 2014, 2002), even if a strictly abductive process has not been strictly followed. This approach has enabled a thorough exploration of the relationships that emerged between the research context and the concepts of paradox theory. As paradox theory and this research follows a social constructivist approach, reflexivity has been essential for critically looking at the experience and process that has created the research (Marshall & Rossman, 2006).

3.2.2 The case research method

Qualitative case research can provide richer insights and analysis into sustainable supply chain practices (Chen et al., 2017), to which sustainable last mile delivery and city logistics belong. Case studies are well suited for exploring real-life complexity and the interrelations and factors that characterize it (Gummesson, 2017), and is thus well suited when society, culture, groups or organizations and other complex contexts are being explored (Marshall & Rossman, 2006). Case research is a powerful tool for developing theory (Voss et al., 2002) and case studies offer flexibility as complementary data sources can be acquired, and the method can encompass several different types of research objectives (Beach et al., 2001). In cases where why and how questions are being asked and the boundaries between the context and the phenomenon are not clear, case studies become a good option (Yin, 2018). Such is the context of LMD and city logistics combined with questions on sustainability. That is why different types of case studies have been selected as the methods in the three essays in this thesis, which explore complexity in both the phenomenon of interest, namely sustainability, and the complex empirical contexts of LMD and city logistics.

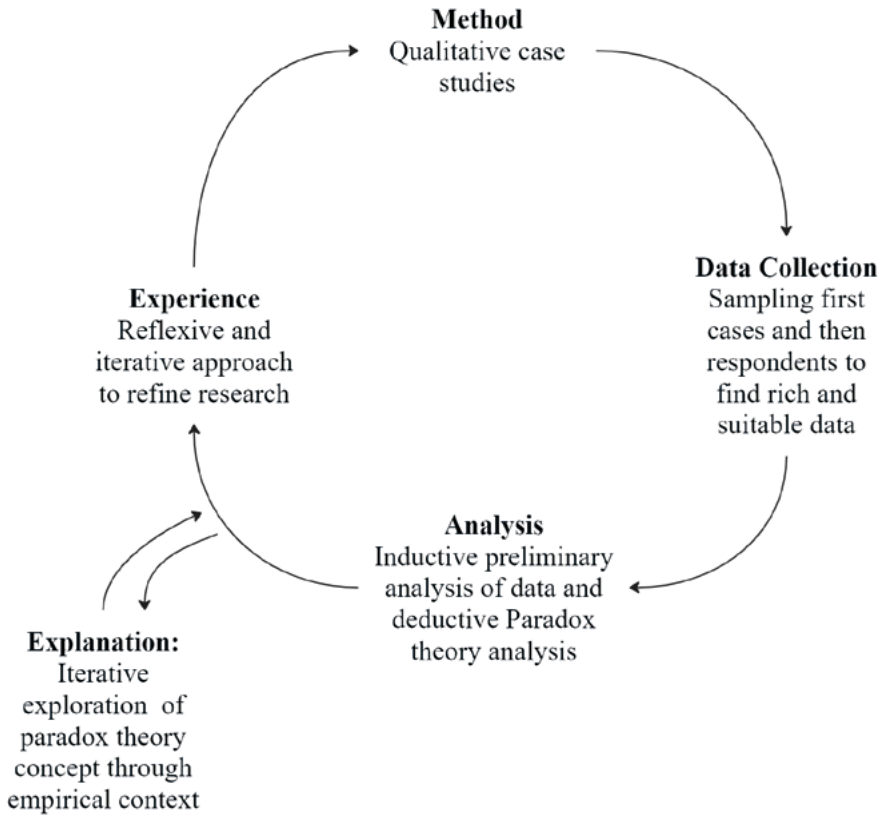

Figure 5 The constructively iterative research approach (adapted from Marshall and Rossman, 2006)

There are different types of case studies, like embedded cases, single cases, and multiple cases (Yin, 2018). This thesis essay 1 is a multiple embedded case study where the managers are seen as embedded cases within their respective organizations. The second essay, which explores the e-grocery delivery context, is a multiple case study with nine retailers, and the third essay is an embedded case study with the three cities of Helsinki, Espoo, and Vantaa that make up the capital region in Finland. Case studies can have a transformative role, but researchers must pay attention to the sampling process and interpretation of the cases to avoid bias and misinterpretation by closely considering the context, accurate analysis, and representative data (Burian, 2001). That is why the next sections and summative Table 4 provide insight into the data, sampling, and analysis in the three essays that make up this thesis.

3.2.3 Data sampling

The sampling strategy helps set boundaries that define the case study so that a sample that can help confirm, uncover, or qualify the studied constructs is achieved (Miles & Huberman, 1994). As case studies are limited, it makes sense to choose cases where the process of interest is "transparently observable" (Eisenhardt, 1989, p. 537). In the case of cognitive frames (essay 1) and tensions (essays 2 and 3), the observability of both concepts is challenging. It could not be said to be evidently visible in simple case selection. That is why a purposeful sampling strategy was utilized for all three studies. The key to purposeful sampling is selecting cases rich with information to obtain in-debt study possibilities (Patton, 2015). The core sampling strategy in Essays 1 and 3 was purposeful criterion sampling (Patton, 2015). Essay 2 utilized intensity sampling (Patton, 2015) to maintain quality and make sure the cases meet pre-determined criteria and can thus be information-rich. The factors that define the case sample should remain constant across all case companies (Voss et al., 2002). The data in this thesis was selected to represent different perspectives; retail, LSPs, and cities, as these belong to some of the more prominent stakeholders in LMD and city logistics. A summary of data and sampling in the three essays can be found in Table 4.

In essay 1 the case retailers were chosen first, followed by the LSPs, so that the LSPs represented the delivery partners of the LSPs. The retailers were chosen to represent consumer-oriented companies representing different sizes and carrying different products available in established web stores, thus the sample contained only retailers within e-commerce, even if some of them have brick-and-mortar shops as well. The starting point of sampling was a 2021 ranking of the most trustworthy e-commerce retailers in Finland, as viewed by consumers. The case companies were selected before the managers. The manager selection criteria in essay 1 included the manager as being operationally involved with the execution of LMDs. The managers needed to have significant LMD experience and have a position of such managerial relevance that their decisions and opinions could have strategic relevance for the execution of LMD.

Essay 2 also employed purposeful criterion sampling (Patton, 2015) to select nine e-grocery retailers. These retailers were chosen to represent different business models and ways of delivering e-groceries, thus varying the expanse of their geographical scope, ranging from local operations in Finland to global operations in 70 countries. The selection process involved identifying suitable e-grocery retailers and then targeting respondent managers within these organizations. The e-grocery retailers included in the study purposefully represented various business models, such as platform-based models, traditional brick-and-mortar grocery chains, specialized grocery retailers, direct-to-consumer retailers, and pure-web e-grocery businesses. This was done to represent tensions impacting sustainability in e-grocery delivery.

In the third essay, the embedded case study focuses on three Finnish cities that comprise the capital region: Helsinki, Espoo, and Vantaa. These cities are interconnected through the HEVI innovation program, which fosters cooperation in innovation and logistics, and they are geographically a unified area, even if they are administratively three different cities. The capital region in Finland was selected because all cities focus on sustainability

in their strategies and have recently promoted or piloted sustainable city logistics solutions. Respondents within the cities were selected using snowball sampling, where relevant departments were initially chosen, and then respondents within these departments were identified based on recommendations. This ensured that individuals with the necessary expertise were included to answer interview questions. Cross-departmental representation was achieved, with respondents including officials responsible for traffic, environment, business development, regional development, and the operation of last mile pilot programs.

3.2.4 Data collection

All essays included various case data types, enabling triangulation between data sources. The data in this thesis consists of semi-structured interviews, secondary data in the form of reports, news, and other relevant documents, observations, and workshops. The combination of different data sources was done to utilize the strength of each data source and provide a suitable data set for each essay (Marshall & Rossman, 2006). All essays followed a pre-approved data management plan that ensured proper data management and rigor in handling and storing data.

In all three essays, semi-structured interviews were conducted. This ensures rich data and exploration. All respondents were presented with the purpose of the interview and the intent and data storage and handling so that every respondent could provide informed consent for their participation in the research. As language and narration are essential in social constructivism, it was necessary to ensure the possibility for conversation and elaboration from the interview respondents. In all three studies, the interviews were transcribed to maintain access to the formulation and direct chain of evidence. However, as Marshall & Rossman (2006) point out, the researcher must be aware of the difference between spoken and written language and the meaning that can be lost when transcribing and translating. This was of particular importance in this essay, as interviews were conducted in three languages: Finnish, Swedish, and English. All essays are written in English, and special care had to be taken by the researcher to understand and weigh the nuances in the translation of, for example, quotes. However, these three languages are ones that the researcher speaks fluently and could validate answers and nuances in all of them. In cases of unclarity, other researchers with an understanding of the languages were consulted to provide the best possible translation. One example was the use of the word sustainability, which can translate to both “kestävyys” and “vastuullisuus” in Finnish. When translating the interview protocol to Finnish, this nuance was incorporated in formulating questions. The different formulations and uses of the word sustainability were incorporated during the interviews to ensure the respondents knew the terminology and meaning.

The use of secondary data sources enables triangulation, which supports the validity of the study (Meredith, 1998) and provides underlying support for constructs and propositions (Eisenhardt, 1989). Thus, all three essays in the thesis have utilized secondary data. Observations include systematically noting events and can be a good tool for validation (Marshall & Rossman, 2006). Observations have been used to interact with

web shops, note the process a consumer would encounter, and observe workshops and events for validation purposes.

In essay one, the data consisted of 13 semi-structured interviews, supplemented by sustainability reports and other company documents, as well as observations of the respective web stores of the retailers, where the researcher went through what a shopping experience and check-out would look like to identify how the last mile is presented and what options were provided. The observations were captured in notes and screenshots. In Essay 2 the data consisted of 19 semi-structured interviews from nine e-grocery retailers. The data collection was done in two stages. A first phase of nine interviews followed an updated interview protocol, and a second phase with 10 interviews.

The secondary data in Essay 2 was collected during both phases of the data collection and consisted of sustainability and annual reports, company news highlights, and website and shop information. A sample of news media items were collected as secondary data sources for reflection and analysis purposes. A news search was done individually for all case companies in the most prominent Finnish newspaper (Helsingin Sanomat) and public broadcasting company (Yle), including news on the case companies that discuss e-groceries specifically, leaving out non-relevant items. In total, 241 news items were included. A webinar with practitioners was observed to validate the tensions and preliminary research results were presented for paradox scholars not involved in the study. In addition, the first author participated in a full-day e-grocery seminar with all the case companies present to observe and make notes on the discussion to validate the tension analysis.

In essay 3, the data was 18 semi-structured interviews with city representatives representing traffic engineering, project management within city logistics, representatives working with sustainability, and other relevant city authority representatives: the secondary data comprised city policy and strategy documents, logistics plans, and reports. The data also included observations from 3 HEVI workshops. HEVI (Helsinki – Espoo – Vantaa Innovation) is a joint urban development initiative where the three cities co-develop new urban solutions that can be tested. One focus is urban development and logistics, and all projects should consider sustainability. There is a joint board of directors for the program that evaluates the ideas and distributes funding accordingly. The first author of essay 3 attended three subsequent workshops, noting the discussion and how the innovative projects are developed and what themes are discussed. To validate the findings of essay 3, an online workshop with city representatives was held to discuss findings and experiences in sustainable city logistics development.

3.2.5 Reflection on sampling time and respondent understanding of terminology

As discussed in the literature section (2.3), using the concepts of last mile delivery (LMD) and city logistics is not always clear-cut. Thus, reflecting on the terminology used and the respondent's understanding of the concepts is essential.

Several factors were considered when determining the use of "last mile delivery" in the essays for the thesis. First, it was important to maintain consistency by using the same term throughout all essays. Given the synonymous use of related terms in research, consistency in terminology use was prioritized. Secondly, practical considerations, such as media analysis (done for an article not included in this thesis) and search engine preferences, showed that "last mile delivery" was widely favored. A Scopus search early in the PhD process also revealed that the term is most used in research, covering many use cases. Additionally, interviews conducted in multiple languages confirmed that "last mile delivery" was the most understood term among practitioners. Most of the time, respondents referred to LMD as an urban activity. Still, especially in essay 2, non-urban deliveries of e-groceries were discussed, and also, in interviews for essay 1, the respondents discussed differences in urban and non-urban LMDs. Therefore, it was natural to use the term LMD instead of urban LMD, even if most LMD activities occur in an urban setting. Here, it must be noted that the English term “last mile delivery” was also shown and discussed in Finnish and Swedish interviews. It also needs to be noted that, especially in essay 2, where the context was e-grocery delivery, the retail respondents considered LMD done in non-urban or rural areas.

In the very early stages of planning and scoping essay three, I attempted to contact the first respondents in Helsinki and Espoo and discussed the last mile with them. Initially, the scoping of article three was supposed to focus on the last mile. However, it turned out that the respondents did not show interest in the topic or said they did not know anything about it. Thus, a reframing was done, and through conversations with city officials, it was agreed that city logistics is a better term to use and approach respondents with. This pivoting turn for the essay changed the focus from LMD towards a broader city logistics perspective. Thus, it was a collaborative effort to scope the meaning of city logistics, and each interview started with a discussion on the intent of the interview and what they thought could be the part of the respondent's work that coincides with city logistics. Through this process, a wide range of understandings was apparent, and it was decided that a broad definition of city logistics, in this case, based on the one offered by the work of Dablanc (2007), was chosen.

All data was collected between September 2021 and May 2023. During this time, some events could have impacted the data. European legislation came into force, and several global events, such as the global COVID-19 pandemic, the war in Ukraine, inflation pressure, and many other events, might have shaped how respondents answered questions regarding sustainability. On one hand, sustainability has become more topical than ever. At the same time, most organizations are under constant pressure to deal with disruptions and increased cost levels. That means tensions are likely to present as they both need to address sustainability and have heightened pressures toward cost savings. It is not entirely possible to eliminate the effects of current events on the data. Still, through theorization and rigorous analysis, this thesis has strived to deal with the data in a structured way to determine underlying dynamics that can be generalized. A summary of data used in the individual essays can be found in Table 4.

3.2.6. Data Analysis

As described above, this thesis has adopted a constructively iterative research approach that includes induction and deduction. The data analysis in all three essays was incorporated through an iterative multi-step analysis process. Preliminary data analysis is important, especially for iteration, as the preliminary analysis allows the researcher to engage with the data and highlight emerging issues to provide direction for further analysis (Grbich, 2007). An initial thematic analysis of the data can also be used as a means of data reduction that can help with further analysis (Grbich, 2007). They were recorded and transcribed to aid with the coding and analysis of the interviews in all essays. Transcription allows the researcher to go back and evaluate what and how the respondents answered a question (Saunders et al., 2015). NVivo software was then used to help with a structured coding process, allowing us to go back and review codes during the iterative process.

The analysis in Essay 1 was concerned with cognitive frames (CFs). From a social constructivist perspective, CFs are interesting as they represent the individual sensemaking of a manager in the way they make sense and then verbalize this sensemaking and the essence of constructionism is exploring how different people make sense of various contexts and perceive situations (Grbich, 2007). Cognitive processes and structures can be inferred from reports and behaviors, though they are not always evident (Scott et al., 1979). Essay 1 used a simultaneous coding process to analyze the data for both the content and structure of cognitive frames. Cognitive frames (CFs) comprise context-specific content described as attributes (Hahn et al., 2014; Menon, 2022) and the relationships between these attributes (Menon, 2022), forming the CF structure (Hayes-Roth, 1977; Preuss & Fearne, 2022). The analysis focused on distinguishing the content domain and the CF structure (unidimensional, hierarchical, and paradoxical, as presented by Preuss and Fearne, 2022).

In the first cycle of coding, structural coding (Saldaña, 2009) was used to identify the elements, such as purchasing electric vehicles to reduce emissions, making up frame content. These were then grouped into themes using pattern coding (Saldaña, 2009), forming the CF content domain. The content domain represents operations linked to sustainable LMDs, compared to sustainability areas in literature and secondary data to identify unmentioned topics. *In Vivo* quotes, a mechanism to code quotes in NVivo, was used in the first cycle for the frame structure. This was done to capture managers' language and perspectives (Saldaña, 2009). In the second cycle of coding, an iterative theory-matching approach (Dubois & Gadde, 2002) was used to align in vivo quotes with frame indicators in the theoretical framework. This analysis checked for frame indicator logic in the empirical data. In vivo, quotes revealed logic, structure, and associations throughout interviews, supported by connections in the content domain coding.

In essays 2 and 3, the analysis of tensions was focal. Tensions have been criticized as being a somewhat fuzzy concept (cf. Carmine and De Marchi, 2022). That is why rigorous iterative analysis was needed to establish relevant tensions in each research context. At the core of analyzing tensions is the reflection that the experience of paradox can depend on both the person, context, and organizational issue at hand (Hahn & Knight, 2021), so

a precise and iterative analysis approach is needed for the researcher to capture and understand tensions. This has by Jarzabkowski et al. (2019) been described as zooming in and out and following the tensions and paradox across the data, tracking shifting contradictions, and identifying interdependence by monitoring boundaries.

First, the elements of the tension need to be identified, meaning the values, objectives, or activities that could be said to be interdependent and in opposition (Cameron & Quinn, 1988). Both essays used an inductive exploration of the data. To then code for tension, versus coding (Saldaña, 2009) was used to identify opposition through verbalization of respondents or triangulating responses with other data sources. As a second step, the knotting or entanglement of the tensions with other tensions was then analyzed in how the tensions are connected (Jarzabkowski et al., 2013, 2022), tracking the shifting contradictions and interdependences (Jarzabkowski et al. 2019). Thirdly, especially in essay 2, the zooming in and out across the system and different levels of analysis (Jarzabkowski et al. 2019) was important in establishing tension levels and interactions. In Essays 2 and 3 special attention was also paid to analysing paradoxality of the tensions through opposition, interdependence, and persistence (Carmine & De Marchi, 2022). This process includes inductively understanding the data and its themes and deductively being able to match the theoretical concepts and their application with the data. This process can be helped by visualization (Pradies et al., 2023), so the online tool Miro was used to enable visualization and iteratively work on the analysis.

In essay 3, the tensions were then further elaborated on through first identifying the measures cities take in response to them and secondly identifying the tensions responses (Lewis, 2000) as well as what type of power (Hardy, 1996) indicated. This was done through an iterative process where all the measures, including collaboration processes, specific last mile projects pilots, and strategic city logistics programs, were matched with the main tensions identified. For example, restrictive city regulations such as time restrictions are a response to spatial tensions. These measures were then deductively analysed both as to what type of power (resource, process, meaning, and system) they seem to display as well as what kind of response to tension they were, in accordance with how Lewis (2000) have described tension responses as acceptance, confrontation, transcendence as well as the vicious responses of splitting, projecting, repressing, regression, reaction formation, and ambivalence.

Table 4 A methodological overview of the essays

	Essay 1	**Essay 2**	**Essay 3**
Method	Multiple embedded case study: managers as embedded cases within their respective organizations	Multiple case study	Embedded case study: cities embedded in the capital region
Empirical context	LMD from the perspective of e-commerce retailers and their LSP partners	LMD in e-grocery delivery	City logistics in cities in Finland
Unit of analysis	The manifested sensemaking that can indicate the CF of a manager	Tension	Tensions and subsequent measures as expressions of response to tension
Level of analysis	Individual (manager)	Individual, Organization, System	Organization
Sampling	• Purposeful criterion logic for information-rich, high-quality cases (Patton, 2015) • Retailers in consumer-oriented businesses with substantial e-commerce presence • Purposefully choosing companies of different sizes and with different products • LSPs were selected based on their partnership with the selected retailers. • Case companies selected, followed by managers (respondents) within them. • Managers chosen to represent operational involvement with LMDs and significant experience. • Companies represent Nordic and European organizations	• Purposeful intensity sampling to best represent phenomenon (Patton, 2015) • Nine retailers were included in the study. • Geographical scope Finland (local) to global (operational in 70 countries) • Identification of suitable e-grocery retailers and then respondent managers within them • E-grocery retailers purposefully represented different business models: platform, traditional grocery chain (brick-and-mortar), specialized grocery retailer, direct-to-consumer retailer, pure-web e-grocery.	• Case cities are 3 Finnish cities that make up the capital region in Finland: Helsinki, Espoo, Vantaa • Cities also connected through innovation and logistics cooperation (HEVI innovation program) • Respondents were selected using snowball sampling: the relevant departments were first selected, and then respondents within them, based on recommendations from the departments themselves, who identified the relevant know-how needed from respondents to answer interview questions. • Cross-departmental representation ensured: respondents represent officials responsible for traffic and the environment. Business development, regional development, and running last mile pilot programs.

Data	• 13 semi-structured interviews • Sustainability reports and statements as well as observations (screenshots) from webstores and CVs of managers as secondary data	• Two stages of data collection • 19 semi-structured interviews with e-grocery retailers • 123 company documents (sustainability reports and documents, retailer news and case examples and other relevant documents) • 241 news media articles from Finnish media outlets to validate	• 18 semi-structured interviews with city representatives • Secondary data in the form of city policy and strategy documents, logistics plans, and reports • Observations of 3 HEVI workshops where joint measures are planned. • Webinar workshop with city representatives
Coding and Analysis	• Inductive pre-coding of interviews • Using theoretical CF framework for analysis • Simultaneous coding process for frame content and structure • Pattern coding for content. • Elaborative coding for empirical frame indicators • Comparing and triangulation of data • Structuring of results	• Coding for tensions utilizing versus coding and triangulating data sources indicating conflicting elements. • Analyzing knotting through grouping tensions in higher-order clusters • Identifying tension levels by drawing connections between tensions and their level of occurrence • Analyzing the paradoxicality of tensions (persistence, interdependence, and opposition) • Abductive analysis	• Identification of relevant theoretical concepts and definition of their use for analysis • Coding for tensions utilizing versus coding (Saldaña, 2009) and triangulating data sources indicating conflicting elements. • Identification of measures mentioned in both interviews and secondary data • Measures analyzed towards types of power framework and response types
Quality measures	• Using multiple sources of evidence • Basing analysis in theory • Quotes to support chain of evidence • Using original data sources • Preliminary results presented to retail and LSP managers at a webinar to validate findings. • Transcription of interviews	• Using multiple sources of evidence • Basing analysis in theory • Quotes to support chain of evidence • Webinar with practitioners to validate findings. • Presentation and discussion with paradox scholars not included in study • Observation of full-day e-grocery seminar to validate findings.	• Using multiple sources of evidence • Quotes to support chain of evidence • Observations from workshop with city re to validate findings. • Presentation and discussion with paradox scholars not included in the study.

3.3 Quality of research and reflexivity

The quality and rigor of qualitative studies is defined by what Lincoln and Guba (1985) call trustworthiness. Trustworthiness and the authenticity of research in the form of credibility, transferability, dependability, and confirmability are reasonable measures to discuss quality also in logistics and supply chain research (Halldórsson & Aastrup, 2003). A summary of the trustworthiness criteria and their application in all the essays in this thesis is presented in Table 5.

Table 5 The trustworthiness criteria and their application in this thesis

Criteria	Criteria description	How criteria have been ensured in this research
Credibility	Truth value: The truth value of the findings	• Data triangulation, using multiple sources such as secondary data and interviews. • Transcription of interviews to ensure respondent meanings are appropriately captured. • Verification of information and responses in interviews that follow. • Validation measures have been taken, such as presenting preliminary results for respondents and/or other researchers not involved in the study
Transferability	Applicability: How findings have been applied with other subjects or in another context	• Purposeful sampling of both cases and respondents, as well as the secondary data sources • Clear descriptions of the research context • Using multiple cases and respondents to gain a better and broader understanding of the context. • Using theory to abstract knowledge
Dependability	Consistency: Replication possibility of the findings with the same context and/or subject	• The data analysis process is described in each essay. • When possible, a figure has been drawn to illustrate the data analysis process and support any written analysis descriptions. • The description of sampling methods and case selection motivations
Conformability	Neutrality: The biases, interests, motivation, or perspectives of the researcher have not determined the findings	• The studies have been based on existing research to create a firm theoretical base. • Theoretical frameworks have been applied to help reduce bias. • Other researchers and respondents have been invited to give feedback and/or validate findings. • Findings have also been compared with the literature

Credibility, or truth value, has been ensured in all essays through verifying information, recording and transcribing interviews, triangulating data sources, and presenting results to other scholars for feedback. Transferability has been assured by using different

contexts and data in the three essays and using theory to abstract knowledge. The analysis process has been described in each assay and illustrated, when possible, to ensure dependability. Of the quality criteria, conformability in the sense of reduced bias (Guba & Lincoln, 1994) is the one that brings the most limitations, as all researchers have their biases and predefined notions that might influence them unknowingly. However, the doctoral education and supervision, the use of theory and literature, and the continuous presentation of research findings to academic and practitioner audiences have helped reduce conformability, even if I acknowledge that the complete reduction of confirmability is likely impossible. This brings about the need for reflexivity, which is essential in a social constructivist approach where there is a need to discuss how knowledge and information are understood. Qualitative researchers need to continuously reflect on who they are in the research and analysis process and reflect and iterate on the analysis (Marshall & Rossman, 2006). The researcher must reflect on how the background and position might influence what is investigated, how and why it was explored, and how the results have been interpreted (Alvesson & Sköldberg, 2018).

One way in which this reflexive practice has been incorporated is partly through iteration and external validation, where knowledge creation is a process between the researcher and the data (Gummesson, 2017). Thesis research is part of extensive research training at a higher learning institution with two supervisors. The combination of supervision and learning through PhD courses has allowed reflection on my position as a researcher in this process. In validating research findings in all different essays through, for example, workshops and observations as well as presentations to scholars not included in the work, I have also made sure to distance myself from the data and be critical of the analysis. At the time of writing, the first essay was published, and the second was reviewed, both of which had undergone significant changes and improvements due to the review process and the external reviewer's comments.

First, what is important to acknowledge is that I value sustainability. One of the reasons I chose to endeavor into the journey of doing my PhD was because I wanted to learn more about sustainability and because I was concerned for current managerial and business practices, having been working for approximately ten years in technology and related industries, in and together with startups and venture capital funders. This means that I have perceived sustainability values, both social and environmental, as both essential and valuable. This could be seen as a bias and an emphasis on this issue. Still, on the other hand, an interest in and attention to detail in the sustainability discussion is a prerequisite for conducting quality research in this area. I believe integrative logic, such as the one presented in Figure 4, is needed to address sustainability truly. I still acknowledge that current business practice and research are somewhat limited to a more instrumental “triple bottom line” approach and that research might not be as holistic as idealists like me would wish. Thus, sustainability has been addressed in the way this research area and PhD process has allowed.

Secondly, I am a Finnish person who has conducted research in a Nordic context. This means I have understood cultural clues and spoken to many respondents in their first language. Would my research context have been somewhere else; my understanding of cultural nuance or language could have prevented deeper analysis. Especially in the case

of sensemaking, understanding the original responses and not having to rely on translations seems essential. Also, from the data quality perspective, having respondents speak their first language in interviews could ensure quality. In constructivist inquiry, a critique has been put forward that the focus is often on the micro rather than the macro perspective (Grbich, 2007). The extensive use of theory has enabled an abstraction of knowledge and data analysis on all levels. This also relates to discussing social sustainability with managers in essay 1. I have a fair understanding of the societal context and a critical view of all aspects that could be included in social sustainability perspectives. This means I would not let the managers address the workforce and be happy with this answer regarding social sustainability.

4. SUMMARY OF THE ESSAYS

This section summarizes the three essays in this composite thesis and provides a summative table (Table 6) with an overview of all three.

4.1 Essay 1: Exploring how retail and logistics service provider managers make sense of sustainability in last mile delivery

This essay has been published in the *International Journal of Physical Distribution and Logistics Management* Vol 54, No 2, pp. 139-162, and is attached to this thesis.

This essay is a multiple-embedded case study. Data was collected from interviews with e-commerce retail and LSP managers who are not actively involved in sustainability work but engage in LMD operations and make operative decisions about LMDs. The purpose of the study is exploratory and aims to open a new line of inquiry and discussion within the last mile, which is heavily focused on operative challenges. With few sensemaking perspectives available in LMD research, this study uses the cognitive frame (CF) concept as a lens to explore the indications of frames. The way a person speaks about operational events can discern some of their sensemaking around the topic. Thus, this study answers a call to better understand operational outcomes of managerial framing and a more nuanced picture of sustainability in LMDs that also includes social considerations. As the sustainability question becomes more critical to address and the LMD landscape becomes more complex due to urbanization, the growth of e-commerce, and the influence of the Covid-19 pandemic, this study looked into how the two key actors executing LMDs, retailers, and LSPs deal with the complexity of working with sustainability.

Utilizing the concept of cognitive frames (CFS), the study aimed to illuminate how LSP and retail managers make sense of sustainability in their LMD operations. The study used the cognitive frame framework of Preuss and Fearne (2022) that divides sustainability framing into unidimensional, hierarchical, and paradoxical, and this framework was used as an analytical lens to explore which operative activities managers associate with sustainable CFs. The findings indicate that most managers frame sustainability with a hierarchical framing allowing for sustainability in the form of CO_2 reduction to be of interest if it adheres to thoughts on eco-efficiency. The other part of the managers framed sustainability in a unidimensional way where sustainability exists in strategy but does not extend to LMDs due to the cost focus. No manager could have been said to frame sustainability paradoxically.

The study contributes to calls for a better understanding of cognitive and behavioral impacts on supply chains (Fahimnia et al., 2019) by providing empirical frame indicators for the unidimensional and hierarchical frames. The propositions in the study suggest that sustainability in LMD is primarily framed as environmental sustainability. It answers calls for a better understanding of social sustainability in LMDs (cf. Nenni et al., 2019; Olsson et al., 2019) by proposing how a paradoxical managerial framing of sustainability in LMDs could enable the inclusion of social aspects in LMDs. The findings showed how the framing of sustainability manifested as an externalization of

sustainability towards partners and customers and as a compartmentalization of LMD from the supply chain. The complexity reduction of environmental responsibility to CO_2 reduction was also observed. The findings also suggest that deeper retailer and LSP collaboration could help in finding ways to integrate sustainability and paradoxical framing in LMD operations.

4.2 Essay 2: Exploring multiple levels of tensions impacting sustainability in e-grocery delivery

This study takes place in the increasingly popular context of e-grocery delivery, which has undergone a huge growth spurt since the pandemic. The study answers a call for a more comprehensive understanding of sustainability in e-grocery delivery and retail. A multiple case study with nine retailers and 19 interviews supplemented with secondary data consisting of 123 company documents and 241 news media articles to validate the findings. The case retailers operate primarily in the Nordics and Europe, and the respondents worked mainly in Finland, but the platform companies operate on a global scale.

The study utilizes paradox theory by theorizing tensions at the individual, organizational, and system levels that impact sustainability in e-grocery delivery. The study also shows how tensions in the e-grocery delivery form a paradoxical knot that centers on a retail organization's instrumental cost- and profit focus. Several significant tensions at the system level impact sustainability, namely competitive pressure, venture capital, and external disruptions. These tensions have a collective impact on sustainability when the power dynamics created by competition steer away the focus from sustainability. At the same time, authorities can take the role of balancing sustainability tensions. Disruptive events also impact retailers who balance a dynamic market environment with many tensions and power dynamics created by actors such as venture capital, which have an impact on sustainability. E-grocery delivery providers need to balance the dual role of the customer. Customers are seen as consumers with increasingly individualized needs and preferences simultaneously as their collective choices create market demand. In this case, polarized sustainability development and performative sustainability actions impact sustainability. From an operations perspective, the multitude of tensions in daily operations create obstacles for sustainability development as the different aspects from fulfillment to delivery are entangled and impact each other, creating a chain of events that can be hard to manage. At the same time, e-grocery retailers maintain a delicate balance of profitability in their business models and continuing development to enhance sustainability through measures like utilizing delivery return flows for circular economy services.

4.3 Essay 3: How cities use power when facing tensions in sustainable city logistics development

The third essay is a study in the context of city logistics and takes the city's perspective as an organization. The essay is an embedded case study within the capital region of Finland, consisting of the cities of Helsinki, Espoo, and Vantaa. Cities are experiencing sustainability pressures and a changing city logistics scene where, for example, last mile

delivery introduces more traffic and innovations on the city streets. As the city carries the role of catering to different stakeholder needs, including residents and other companies, it is facing several tensions. The study takes a starting point in detecting the tensions the city faces in sustainable city logistics development and goes further to identify the types of power (Hardy, 1996) used in the measures the city takes to further develop and respond to tensions. The types of power used are then analysed in the light of tension responses (Lewis, 2000). The study finds that the city faces tensions regarding the role of the city, the operations of sustainable city logistics, stakeholders, and spatial and temporal tensions. The city role balances between taking an active stance towards developing sustainable city logistics or being a platform for company development initiatives. Here, the power of the private sector is tangible, as is the reluctance of cities to engage in restrictive measures. When operating in the sense of planning and execution of logistics activities are concerned, sustainability values take the back seat to innovation and technology and seem to be the core value in solutions when development is executed primarily through pilots. Execution also focuses on emission reduction and social issues, and aspects of urban biodiversity are mainly neglected. The multitude of stakeholders creates tensions internally and externally. The city's needs are balanced with company needs, and national vs. local authority perspectives are a tension. Residents are seen mainly as consumers and thus risk being considered only to the extent their use of LMD services is concerned. The limited city space is a spatial tension, as is the difference in the pace of development between cities and the private sector.

The power of resources comes from physical or financial resources; the power of process is expressed through decision-making and other processes that impact actions and outcomes; the power of meaning is embedded in the use of ritual, symbols, and values, and the power of the system is ingrained in the structures of organizations and institutions (Hardy, 1996). In the city logistics context, all types of power are used by the cities. Still, cities primarily use the power of process, and it is highlighted in collaboration and cooperation as measures towards tensions. The power of meaning can be seen in the strategic programs and values, where sustainability is a key value. However, this power of meaning is not transferred from higher-level documents to execution but is instead exchanged for innovation and technology. That means that by the time a city logistics pilot is executed, the foremost value is placed on innovation or technology, rather than sustainability, which is seen more as a nice side effect. Both restrictive measures and incentives, as well as the redistribution of national and EU grants, are part of the power of resources cities have at their disposal. As a baseline lies the city's inherent systems power in the form of, for example, infrastructure, zoning, and land use. However, the cities were ambivalent and not keen on using this power to further sustainable city logistics. In many ways, it seemed they were not aware of having this power. In terms of process and resource power, cities accepted and acknowledged many tensions but also engaged in ambivalence and repression. Some collaborative measures could be described as confrontational, confronting tensions. The power of meaning measures also presented ambivalence as a response, reaction formation, and, to some extent, confrontation. This means the tension responses cities exhibited were more on the vicious side of tension responses rather than accepting and working with tension. These findings mean cities could be more proactive and realize their role as powerful actors within sustainable city logistics development in the future.

Table 6 A summary of essays in the thesis

	Essay 1	**Essay 2**	**Essay 3**
Title	Exploring how retail and logistics service provider managers make sense of sustainability in last mile delivery	Exploring multiple levels of tensions impacting sustainability in e-grocery delivery	How cities use power when facing tensions in sustainable city logistics development
Author(s)	Helleke Heikkinen	Helleke Heikkinen and Anna Aminoff	Helleke Heikkinen and Anna Aminoff
Publication status	Published	Submitted to Journal of Supply Chain Management	Prepared to be submitted
Research Problem	Retail and LSP managers play a critical role in executing LMDs and thus impact the sustainability of LMD operations. The study explores the potential impact on sustainability that these managers' cognitive frames have on the execution of sustainable operations.	E-grocery deliveries are on the rise, and the sustainability implication of the tensions in this context remains unexplored	The role of the city in developing sustainable city logistics solutions is crucial. However, several tensions impact this development, and the city's role remains ambiguous. The research delves into what type of power and how cities respond to tensions encountered in sustainable city logistics development.
Research Questions	What cognitive frames are indicated among retail and LSP managers when they make sense of their sustainable LMD operations?	What tensions can be detected at and among different levels of e-grocery delivery? How do these tensions impact sustainability in e-grocery delivery?	What are the main tensions the city encounters in developing sustainable city logistics? How do cities utilize types of power in their responses to tensions in sustainable city logistics development?
Method	Multiple embedded case study	Multiple case study	Embedded case study
Contribution	The study contributes a conceptualization for sustainable LMDs, together with empirical frame indicators, and presents three propositions to explicate the findings. The framing of sustainability is focused on CO_2, and a more paradoxical framing would be needed to consider social sustainability aspects better. Collaboration between LSPs and retailers could be key to fostering a	The study contributes by theorizing tensions on an individual, organizational, and systems level in e-grocery delivery and discusses their implications on sustainability, providing potential for greater salience of tensions. It highlights not only specific sustainability tensions but tensions on individual, organizational, and systems levels that have implications for sustainability, even if this might not be evident in daily operations. That is why	Theorizing tension responses and power use, the study reveals the ambiguous nature of the city's role and the dominance of using process power. The findings contrast the perceived dominance of the private sector with the somewhat neglected resource and systemic power the city holds. The study contributes to research by providing more insight into how power and responses might work together and how these concepts can inform each other. For city

	better sustainability integration in LMD. The current framing manifests as an externalization of responsibility and compartmentalization of LMD from the supply chain. For managers, the findings emphasize the need to integrate an understanding of the cognition perspective and allow time and resources for cross-functional collaboration and partner engagement, which could foster sense-breaking. This could allow for a more paradoxical framing of sustainability that can positively impact how sustainability is operationalized.	the study presents the tensions in e-grocery delivery as a paradoxical knot. The discussion on paradoxicality and power dynamics, as well as the system-level tension discussion, contributes to the gap in research on paradox outside the organizational realm that considers the power concept. The findings can help managers operationalize how tensions in their daily environment can be balanced and what they mean for sustainability in e-grocery delivery operations.	logistics research and city authorities, the findings show how the cities deal with tensions in developing sustainable city logistics and highlight the different types of power a city can yield. The findings also contribute by showing how many of the responses cities have to tensions could be more accepting so that positive benefits of balancing them could be achieved.

5. CONCLUDING DISCUSSION

This thesis explored sustainability within the context of LMD and city logistics, aiming to achieve novel insights into the context and how to address sustainability within it. This exploration was conducted through three empirical studies in the three essays that make up this thesis. The following section synthesizes and discusses the findings further.

5.1 RQ1: How might we better understand sustainability in last mile delivery and city logistics?

This research question was addressed in all three essays in different ways. Essay 1 takes its starting point in acknowledging that managers are critical stakeholders in the cascading effects that impact sustainability practices in organizations (Prataviera et al., 2023). The study in essay 1 exposes the indicated CFs that may result in very generic responses towards sustainability, namely treating sustainability primarily as environmental sustainability in the form of carbon emissions. This finding might not be particularly surprising, but what essay 1 contributes is a starting point to understand where this generic response to sustainability comes from and what type of thinking has led to it. It is in situations of turbulence, complexity, and change that trigger managerial sensemaking (Weick, 1995). The evolving LMD landscape and the complexity of sustainability create an ideal opportunity to explore managerial sensemaking, which can enhance the understanding of generic sustainability responses in various logistics contexts. Thus, the study in Essay 1 pinpoints where to start untangling managers' current generic sustainability responses. The retrospective nature of sensemaking (Boland, 2008; Choo, 2002), and the underlying concept for cognitive frames, highlights the appearance of the expected and generic responses in Essay 1. The strategy documents of companies are full of great plans and values that managers execute. Considering Essay 1, it seems these managers do not perceive LMD as part of their organizations' supply chain but have compartmentalized it, separating the issue of sustainability as something that is taken care of elsewhere. They would also like to see the responsibility of sustainability taken by consumers or business partners, and their thinking is dominated by a focus on efficiency, as described by York and Rosa (2003) and in line with the dominant sustainability paradigm (Gao & Bansal, 2013). Acknowledging these cognitive underpinnings is essential if we are to better understand sustainability in LMD and move beyond instrumental unidimensional framing.

So, how might we better understand sustainability in LMD by looking at the results of Essay 1? The social constructivist perspective allows us to view sustainability as a socially constructed concept, shaped not by individual sensemaking alone but through collective understanding within groups and society, as Weick (1995) emphasized. We must acknowledge that a core part of research in sustainable LMD is following the same logic as the managers seem to indicate – focusing on emission reduction and environmental sustainability. While these are great goals and need addressing, both the literature review and the results of Essay 1 point to the need to include a more nuanced view of sustainability. Previous research has painted a complex picture, as shown in Figure 4, and urges to include factors like accessibility, safety, and biodiversity. While Essay 1 does

not explicitly cover these areas, it highlights one of the reasons these topics are not likely to be on managerial agendas. This aligns with most instrumental sustainability perceptions in business (Gao & Bansal, 2013), which, in the light of Essay 1, could be called unidimensional and sometimes hierarchical. In both framings of LMDs sustainability, economic considerations will take precedence. That is why Essay 1 suggests a paradoxical framing could aid in understanding more nuance, especially when it comes to considering social sustainability. Still, in the data, there were some interesting examples of sustainability brought forward by the retailers and LSPs, such as the possibilities for shared data and closer collaboration as a tool to further sustainability initiatives between retailers and LSPs, using packaging that considers environmental sustainability, and making sure renewable energy is powering warehouses and fulfillment centers. Most interesting were mentions of services incorporating reverse LMD back from the customer for recycling and circular services. These aspects of service development and opportunity also emerged in the data of Essay 2, a study concerning e-grocery delivery. These present future research opportunities and shed light on the versatility of LMDs from a service perspective. Necessary for our understanding of LMD sustainability was also the finding that LMD is absent from most retail sustainability and strategy materials. This could indicate that for the managers to take it into account, the strategic relevance of the function should be acknowledged, LMD being a critical success factor for retail (Hübner et al., 2016; Wollenburg et al., 2018).

5.1.1 Social sustainability in last mile delivery

The lack of social sustainability considerations amongst managers might have reflected the societal context where the managers are situated, as the Nordic retail and logistics sector is not known for significant social issues. Insufficient social sustainability amongst managers in essay 1 is relative and probably not purposeful. Understandably, sustainability elements might not be actively considered while focusing on operational priorities like speed and cost. What was essential was not an intentional neglect of social sustainability but the difference in focus of environmental and social questions. While managers associated sustainability with emission reduction, they had to be prompted to consider any social aspects and were not reflecting or associating with this topic. The interviews for Essay 1 were conducted during autumn 2021 and spring 2022, and it must be stressed that the sampling was purposefully focused on managers who are not sustainability managers, i.e., respondents who work operationally with LMDs. By this time, two recent events had brought attention to social sustainability in LMD. The first was the pandemic and the different groups, like older people, who needed access to LMD services in a way they previously had not. This discussion came forth in the data collection for Essay 2, where some retailers reflected upon the services they could (and could not) provide to vulnerable customer groups and whether an LMD driver could stay and screw off the caps of bottles or similar activities. Accessibility is a topic that is present in grocery retail literature (Ariza-Álvarez et al., 2021; Dillahunt et al., 2019), and also seems to be on the rise among practitioners in e-grocery delivery. The second thing that might have brought social sustainability to the mind of managers was the rise of on-demand platforms and the issues related to delivery driver work conditions (cf. Moncef & Monnet Dupuy, 2021). However, the respondents in Essay 1 were aware of this, but not as their concern, but rather something others (platform providers) should see to.

It must be noted that very few of us are free of internalized ableism. Ableism could be described as taking our able bodies for granted and not remembering the physical disabilities others might be living with. In the research context of essay 1, it was clear that operationally, LMD was compartmentalized and not seen as integrated in the supply chain. In the same way, the managers probably did not purposefully neglect social sustainability but focused on the sustainability challenges at hand, namely CO_2 emissions, which were tangible and strategically doable. While CO_2 calculations are relatively easy to quantify, social questions seldom are. Managers did, when asked, associate the social sustainability of LMDs with working conditions and equality. While these are important, there seemed to be an understanding that we can be set and content in a Nordic context. The managers did not reflect on the safety of pedestrians, safe driving practices, or accessibility questions. They could reflect on how CO_2 impacts society, but not to any large extent what social impacts LMDs have on society at large. Still, it must be said that it is not managers alone who do not consider social sustainability to a large extent; it is also a relatively neglected area of research in LMD so far. Even if there is exciting research in, for example, spatial accessibility and equity of parcel lockers (Schaefer & Figliozzi, 2021), accessibility of e-commerce and LMD (De Oliveira et al., 2019; Sousa et al., 2023) and critical rethinking of opportunities for disabled people to access transit (Levine, 2023) the research community could help managerial practice highlight issues not salient to them, as questions like accessibility of services or customer safety should be considered in any context. Sensebreaking is what is needed to push a unidimensional "business case" frame into transitioning (Giuliani et al., 2021; Menon, 2022). Essay 1 has highlighted some opportunities to start this work in LMD and point the way for further investigation.

5.1.2 Power dynamics and sustainability

Findings from Essay 2 highlight the need to understand sustainability in LMDs as a multi-level phenomenon, shaped by tensions that may not initially seem directly related to sustainability. For example, the influence of venture-driven markets and competition in e-groceries and disruptive events such as the COVID-19 pandemic or the recent supply chain crisis is relevant to acknowledge because of their impact on power dynamics and sustainability. This means that we cannot isolate questions like LMD sustainability from system-level effects or separate LMD from the supply chain. As has been pointed out in the literature, on-demand and speedy deliveries and their increasing demand influence both environmental and social sustainability (cf. Bjørgen et al., 2021; Moncef and Monnet Dupuy, 2021). Considering Essay 2, we should not discuss sustainability at the end of the supply chain but at the source. While local solutions and innovations may be implemented, if broader market dynamics push development toward unsustainability—such as heightened demand for speedy deliveries—resolving these tensions will require systemic market-level intervention rather than solely within LMD. Again, the assumed power symmetry of much paradox research must be highlighted (Hargrave & Van de Ven, 2017). The study in Essay 2 pinpoints how many e-grocery retailers acknowledge their competitors' different relative market positions and work towards gaining more market share. If power dynamics is not considered in context, the discussion on balancing tensions might lose out on some of its most essential components – competition that creates different power dynamics. Here, the balancing effect and potential of authorities

need to be acknowledged, as they can have a generative impact through regulation that levels the playing field so that all market actors must play by the same rules and address sustainability in the same way. Even if this is not a novel finding by itself, the role authorities could play in a seemingly mundane case of e-grocery delivery is interesting. In summary, Essay 2 highlights the usefulness of power as a concept in paradox theory and shows how power dynamics impact tensions in LMD. Thus, questions about LMD sustainability should not be had without looking at the powerful actors and their relative influence on sustainability. This finding is also a contribution that further explicates the findings of, for example, Sallnäs and Björklund (2023) on the impact of markets on the sustainability of e-commerce.

5.1.3 How might we better understand sustainability in city logistics?

Considering Essay 3, which is based on empirical data from the perspectives of cities, the understanding of sustainability is one of strategic relevance. Essay 3 shows a reality where cities grapple with many tensions regarding sustainable city logistics development. There is an asynchronous situation between the logistics companies that bear the main role of developing city logistics activities and the cities in which the activities take place. The tensions regarding the role of the city, logistics operations, and stakeholder groups, as well as spatial and temporal tensions, illustrate this asynchronicity through a variety of responses. The case cities showed various responses through which they used their power. Hardy (1996) outlines systemic power as a backdrop for exercising resource, process, and meaning power. Two systems could be discussed in sustainable city logistics: the commercial sector and the city itself. The cities in the study control infrastructure, restrictions, and developments through policies but need to leverage this power fully. City respondents assumed power in the commercial sector and showed ambivalence towards the city's systemic power, giving leeway towards the commercial system's power. What this tells us about sustainable city logistics: firstly, we need to look closer at power as it can reveal interesting dynamics behind sustainable city logistics development. Secondly, cities have at their disposal more power that they choose not to use in favor of the commercial sector and the perceived dominance of logistics companies.

It could be said that the same applies to cities for retailers and LSPs—sustainability is a value in strategy but not execution. For the city logistics context, the interesting transformation of sustainability to innovation when sustainable city logistics development, such as pilots, is executed was a relevant insight for discussing sustainability. It highlights the relevance of pinpointing what sustainability means in the city logistics context and how cities execute sustainability strategies. Respondents in Essay 3 highlighted sustainable vehicles, as did the respondents in Essay 2, and the services that are equally important for city logistics, such as warehousing or consolidation facilities, were not considered to the extent they might need to from a sustainability perspective. Here, the city's role in managing land use, zoning, and general city planning can be seen as a crucial activity for city logistics sustainability, as has been pointed out by, for example, Kiba-Janiak et al. (2021). This means in terms of RQ1 that the understanding of sustainability in city logistics is limited to what activities should be involved for sustainability to be enhanced and what departments and functions should

be involved in making city logistics more sustainable. Of course, balancing the tensions involved both spatially and temporally is not easy, but understanding the relevance of an expanded understanding of what constitutes sustainability in city logistics is highlighted.

5.2 RQ2: How do tensions create sustainability implications in last mile delivery and city logistics?

This research question was addressed primarily in Essays 2 and 3, with several implications for sustainability in Essay 2 and learning about the city's role in Essay 3. In essay 1, the framing of sustainability shows a lack of salience of the tensions involved when the managers compartmentalized LMD from the rest of the supply chain and wanted to externalize the responsibility of sustainability toward customers and partners. This tendency to externalize was also visible in Essay 2, where retailers encouraged customers to consume sustainably and focused on the perceived priorities of customers, leading to a focus on sustainable packaging. Exploring sustainability through paradox theory and tensions, this thesis portrays LMD as a versatile and essential part of the supply chain when discussing sustainability. The contribution of both essays 2 and 3 lies in offering a comprehensive picture of tensions. This understanding enables a discussion on the meanings of tensions and paradoxes related to sustainability in the research contexts of e-grocery delivery and city logistics, thereby enhancing their salience for future research and practice. This is a prerequisite for balancing tensions (Schad et al., 2016).

The tension perspective in Essay 2 depicts how it is not specific sustainability questions that should be considered but how different tensions on all levels have implications for sustainability. LMDs are not entirely free from market disruptions or venture capital influence. Therefore, they should not be treated only as an optimization exercise where cost and speed are the main factors. Unfortunately, Essay 1 depicts a situation where the complexity reduction of sustainability in LMD seems to be a reality. For a paradoxical sustainability understanding to become a reality, tensions and their implications for sustainability need to be salient. What is important to note is that the tensions described could be any operational tensions that have implications for sustainability. From the perspective of paradox theory, paradoxical tensions are not to be resolved (Smith & Lewis, 2011) but instead leveraged or dealt with in a both/and manner that accepts their existence (Sharma & Bansal, 2017). That is why, in both essays, the discussion on tensions as paradoxical is essential. There is no doubt that additional research is needed to delve deeper into both tension responses as well as the relative managerial, organizational, and societal salience of tensions, as salience is a prerequisite for any transformation or generative response to tension (Berti & Pina e Cunha, 2023).

The concept Jarzabkowski et al. (2022) call a *paradoxical knot* depicts the phenomenon in Essay 2. The essay results show how the instrumental business focus creates tensions revolving work reorganization, which is essentially a question of cost and profit. This cost-focused nature of e-grocery deliveries highlights the dominant paradigm of business as instrumental and anthropocentric (Gao & Bansal, 2013). Acknowledging the tensions that impact sustainability not as individual trade-offs but as a paradoxical knot brings a more nuanced understanding of sustainability in LMDs. As paradox theory prescribes, if

retailers continue to address single tensions as trade-offs, solving them one at a time, they will still end up in a situation where the same tension reappears. Such could be the customer conundrum presented in essay 2 as the duality of the customer role. As seen in Essay 1, managers might prefer customers to choose sustainable delivery alternatives. Essay 2 gave details about this statement, stating that the customer has two roles, as the individual and as the market, that creates demand. In attending to individualized customer needs, retailers risk-taking performative sustainability actions, such as focusing on packaging materials, while neglecting other potentially more meaningful measures. Still, the retailers are in a double bind, for their customers are also the market that wants speedy on-demand deliveries that come with several externalities. This can, in turn, lead to a polarized sustainability development in LMD. The tension concept implies an acknowledgment of the duality of the consumer role rather than neglecting it.

Tension dynamics, that the elements in tensions can change and the tension persist, discussed by e.g. Hargrave (2021), need consideration in regard to RQ2. As Essay 2 exemplifies, tensions are not simple trade-offs where a retailer chooses between two different routes or delivery vehicles. However, the embeddedness of the vehicles in the operation and the impact competition has on the operation become essential when considering sustainability. In practice, this means the vehicle decision becomes part of many other decisions that, in turn, impact sustainability. That means sustainability in LMDs should also be understood as something that is impacted by several factors, including individual, organizational, and system-level tensions rooted in operations.

Concluding the learnings from Essay 2, tensions create the following sustainability implications; tension nested on different levels can have unexpected sustainability effects, tensions need to be salient, and retailer would need to actively choose to engage and act on the tensions to the extent their power allows. Otherwise, generative outcomes are not likely. As shown in Essay 2, individual tensions do not make or break sustainability impact. Still, the knotting of them and their anchorage in the cost-profit focus that has followed the reorganization of work in e-grocery delivery from the customer to the retailer. If retailers are aware of these dynamics, they could think about ways to work with the tensions and find solutions that have business potential and enhance sustainability, such as utilizing return flows for a circular economy or bridging the gap between customer expectations and impactful sustainability activities. This can be reflected in relation to the findings of Essay 1, where tensions do not seem salient among managers, as none of them indicated a paradoxical frame.

In Essay 3, the city logistics literature already described several tensions, such as spatial and temporal tensions that arise in the confined space of the city and between the development pace of cities vs. the private sector. These are two examples of persistence that can be detected already in the literature. Also, as it continuously evolves, the nature of a city creates some persistence in the context where tensions emerge. In other words, the tensions explored in essay 3 seem rather persistent in their embeddedness in city logistics, making them paradoxical. The most interesting aspects of sustainability implications in Essay 3 are the use of power (Hardy, 1996) and responses to tensions (Lewis, 2000). The measures cities execute present a fragmentation between strategy and execution that can be seen in how the power of meaning is translated from

sustainability to innovation when, for example, sustainable city logistics pilots are executed. Combined with the relative ambivalence towards using the city's power to further sustainable city logistics development in the first place, it seems sustainable city logistics is not a priority. Even when city logistics are developed, sustainability becomes instrumental as a side effect of technology or innovation. This again highlights the eco-efficiency -thinking (York & Rosa, 2003) mentioned in the discussion about Essay 1. In terms of tension responses, the cities also seemed to linger on the more vicious side, presenting more vicious than virtuous cycles of dealing with tensions arising in sustainable city logistics development. For example, splitting the measures and activities between different departments showed how many respondents did not want to engage with the tensions but remained relatively safe in their silos. Still, process power is the most promising use of power to balance, accept, and confront tensions in sustainable city logistics development. The process power in the form of collaboration, coordination, communication, and education showed how the tension response could become generative and how cities could work further towards more sustainable city logistics solutions through using their process power. However, also acknowledging the resources and systems power cities have could help make the city more active towards driving sustainable city logistics development.

5.3 Summary of thesis

LMD might be the last link in the supply chain, but as this thesis argues, it is not the least. This thesis suggests that understanding what sustainability means within LMD and city logistics should be more broadly discussed to incorporate a paradoxical understanding of sustainability. In practice, this means that even if companies need to streamline their operations, they could still consider sustainability elements that seem to conflict. As the framing of sustainability is based on individual sensemaking, joint discussions are essential. After all, societal norms impact how sustainability is valued (Hahn et al., 2018). Considering the results of this thesis, if the prevailing instrumental logic is pursued within business and research concerned with sustainability and LMDs, it is not likely more than emissions reduction is concerned.

As Essay 1 presents, there is a need to understand and discuss the managerial framing of sustainability in LMDs and acknowledge that the current framing of sustainability focuses on emission, externalizes sustainability responsibility, and cannot be described as paradoxical. Still, a more paradoxical framing could be the key to a better inclusion of, for example, social sustainability when discussing sustainability in LMD. From Essay 2, we have learned that LMD sustainability is a question integrated with activities on individual, organizational, and systems levels and is not an operationally isolated question. Sustainability discussion needs to address both markets, the competitive landscape, power dynamics, and the duality of the customer role. In addition, essay 3 shows that cities need to understand what ambiguity their role entails and what that can mean for the sustainability of city logistics. In short, the need to start thinking paradoxically and not instrumentally about sustainability in LMDs and city logistics is highlighted. It also needs to be noted that questions about LMD and city logistics sustainability should not be had without considering the actors' power and willingness to use it. The contributions of the thesis are summarized in Figure 6.

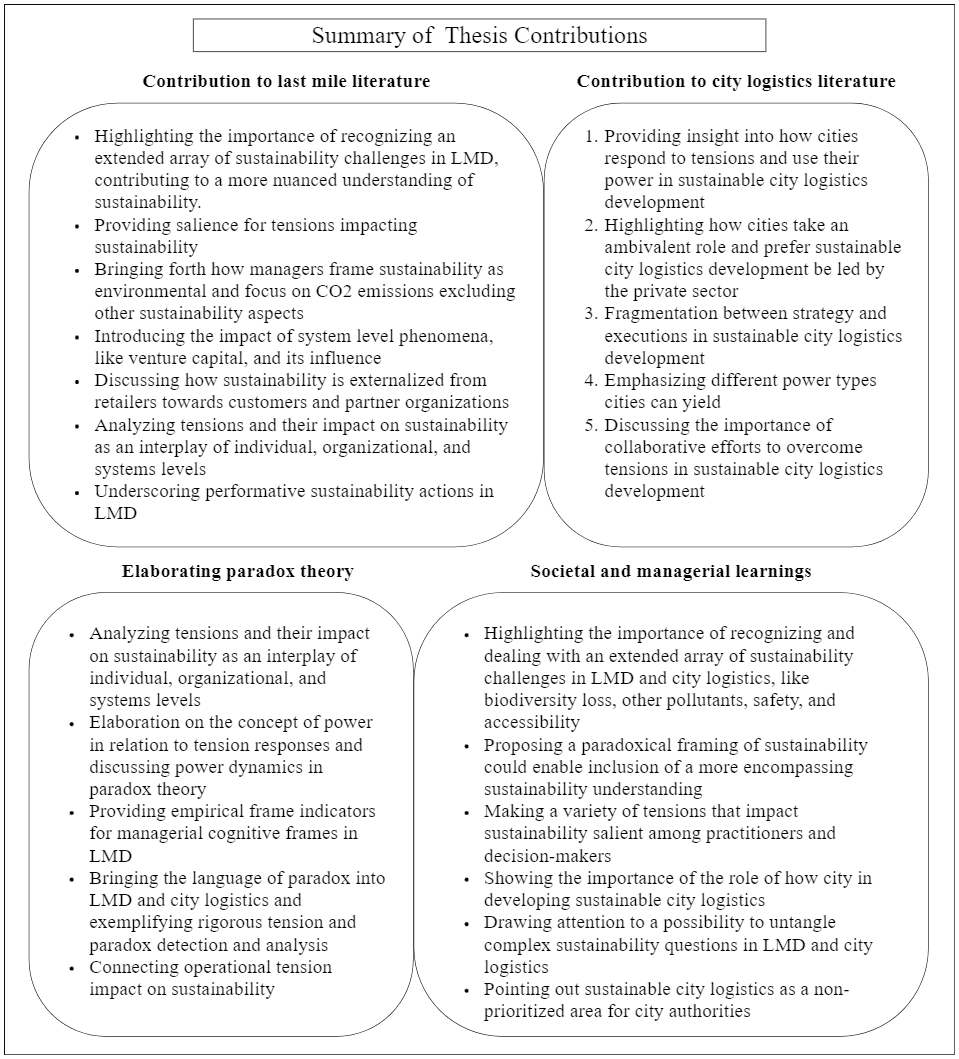

Figure 6 A summary of thesis contributions.

In short, each essay in this thesis contributes towards understanding why it is not likely any dialectical transformation, i.e., a change in the systemic frame of reference, is expected to occur when discussing sustainability in a last mile or city logistics context. The essays make tensions impacting sustainability salient for further research and practice. Firstly, Essay 1 posits that managers' main frame of reference is hierarchical and focuses on emission reduction as what is considered sustainability. Thus, other forms of sustainability will likely become salient after a change in the frame of reference happens. Secondly, as discussed in Essay 2, the paradoxical knot in the e-grocery context that is centered around what could be described as an instrumental profit-focused logic does not seem to provide an ample environment where such a change in the framing of sustainability would be likely to happen. Thirdly, as the third essay concludes, the private

sector holds power that the cities are not expected to grasp, given their ambivalent response towards their potential power and using it to develop sustainable city logistics.

5.4 Theoretical contribution

This thesis contributes to theory by bringing the language of paradox into last mile delivery and city logistics to foster previously unheard-of discussions. If the understanding of sustainability is not taken for granted, and the knowledge of tensions and the impact of power use is considered, this thesis's paradoxical depiction can give space for a new understanding of sustainability in LMD and city logistics through the salience of tensions. As the social constructivist epistemology of paradox theory prescribes (Hargrave, 2021; Hargrave & Van de Ven, 2017), the narration and discourse (Edley, 2001) sustainability within this context can give meaning to a new understanding of the concept. Thus, it can pave the way for change and transformative action using both/and (cf. Smith et al., 2016; Smith and Lewis, 2011) and more-than thinking (cf. Huxham and Beech, 2003) in future research. Paradoxes are phenomena that can never be resolved (Smith & Lewis, 2011), but an organization can leverage paradoxical thinking that accepts the existence of paradoxes to move beyond contradictions and instead focus on synergies (Sharma & Bansal, 2017).

The main shortcomings of paradox theory research are that the research has remained descriptive in nature, focusing on finding and naming tensions (Carmine & De Marchi, 2022; J. Zhang et al., 2021), and leaving the tension concept "fuzzy" and systems-level tensions unexplored (Carmine & De Marchi, 2022). In addition to this, paradox theory research has only recently opened the door toward understanding the power of tension dynamics (cf. Bednarek and Smith, 2023; Berti and Pina e Cunha, 2023). This thesis has contributed by rigorously coding and analyzing tensions and discussing paradoxicality in each research context. It has also exemplified tension and paradox discussions through empirical data from several different contexts. The thesis has also elaborated on discussions on connections between sustainability and tensions, discussing how any operational tension can have sustainability implications. This contributes to a deeper theoretical understanding of LMD and city logistics and opens possibilities for further theorization.

The choice of adding a power framework comes from the theoretical gap of power, indicated in paradox theory literature (see section 2.2.4). The impact of power dynamics in paradox theory is still in a relatively nascent and conceptual phase. Bringing in a power framework from strategy (Hardy, 1996) is a way of explicating the use of power in paradox theory. As Essay 3 shows, the use of different types of power in combination with tension responses contributes to an interesting juxtaposition between the uses of power and what they mean, as contrasted with tension responses. The study enhances research by offering more profound insights into the interplay between the use of power and responses and how these concepts can mutually inform each other. The Hardy (1996) power framework directs the empirical city logistics context. It means understanding power as concrete measures, e.g., land use, collaboration, or the allocation of funds to different LMD projects. For city logistics research and city authorities, the thesis illuminates how cities manage the tensions involved in developing

sustainable city logistics, emphasizing the various types of power a city can wield. It also shows the city's ambivalence regarding developing sustainable city logistics solutions. Additionally, the findings suggest that cities could adopt more accepting responses to these tensions, which could help achieve positive outcomes by effectively balancing them.

This thesis also highlights why studies in social sustainability might be hard to execute, as social sustainability in LMD is not widely considered in companies. It also shows the last mile as versatile and integrated into the supply chain, noting the importance of considering supply chain perspectives in LMD research. This is important to connect individual, organizational, and systems-level considerations for the last mile and city logistics in the future. The contributions to the fields of last mile and city logistics research are also of managerial and societal importance, and thus, the societal implications below are to be considered theoretically as well.

5.5 Societal implications

This thesis and the three essays within it portray a need for managers in retail, LSPs, and cities to start thinking differently about LMD and city logistics regarding sustainability.

Firstly, this thesis underlines the importance of considering aspects of sustainability other than carbon emissions. Even if carbon emissions are an essential focus, they only constitute part of the picture of sustainability in the last mile or supply chain. This thesis highlights how there has been a neglect of other issues such as other pollutants, biodiversity, and social considerations like safety and accessibility, and how the prevailing instrumental and hierarchical view on sustainability prevents a managerial understanding of sustainability as many different things. The thesis also shows that, while, for example, social sustainability might be considered in some parts of the supply chain, many retailers do compartmentalize the supply chain and see social sustainability as a concern only downstream of the supply chain. In the case of framing sustainability paradoxically, retail and LSP collaboration could be a tool to enhance perspectives and provide a more profound integration of sustainability in LMDs.

Secondly, this thesis calls for acknowledging and discussing tensions and their implications for sustainability amongst managerial practice and city authorities. In illustrating tensions in both e-grocery delivery and city logistics, the thesis can be an introduction to untangling the complexities sustainability questions create in both the last mile and the city logistic context by making tensions salient. As was shown in essay 2, it is not the individual tensions that make-or-break sustainability impact, but their knotting and anchorage in the reorganization of work. If, for example, retailers are aware of these dynamics, they could think about ways to work with the tensions and find solutions that have business potential and enhance sustainability, such as utilizing return flows for a circular economy or bridging the gap between customer expectations and real sustainability impact.

Thirdly, the prevailing instrumental sustainability logic shown in this thesis's three essays presents a barrier to balancing sustainability tensions and, thus, needs consideration. This thesis calls for paradoxical managerial thinking. Tensions mean for

sustainability that, to make them generative, they need to be salient, and the actors involved would, to the extent of their power, need to choose to act on the issues at hand.

Fourthly, the thesis highlights power as an element of consideration when sustainability discussions occur. From the perspective of paradox theory, the thesis can help managerial practice to consider their relative power stance and the impact of power dynamics questions relating to last mile and city logistics sustainability. For example, in a city logistics context, utilizing process power through collaboration, coordination, and communication is a way to confront, accept, and balance tensions. Cities should also acknowledge their resource and systems power to engage more in sustainable city logistics development.

5.6 Limitations and suggestions for future research

There are some limitations to this study that need to be considered. This thesis's theoretical assumption underlines the paradox's positive potential, even if contrary evidence has also been presented. This study also has a geographical limitation: the empirical evidence was collected primarily in the Nordics. This sets some limitations, especially in social sustainability considerations, as the Nordics are known to be safe and have no significant societal work or life-related struggles. However, the Nordics is part of the EU, and many regulatory frameworks and expectations for companies span at least across the European Union and globally. The discussion on, for example, delivery worker rights and working conditions is not specifically European or Nordic but a global phenomenon, as is the increased interest in other sustainability questions. Even if the empirical geographical scope poses some limitations, the paradox analysis enables generalization on underlying tension dynamics, which are likely to occur in other geographical and company contexts. They could still benefit from verification in future studies.

The empirical context of the thesis includes retail, LSPs, and cities but does not reflect other stakeholders' perspectives, such as customers or city residents. The perspective of these could and should be considered in future research endeavors. The lack of long-term temporal perspective and longitudinal research in this thesis is also a limitation due to the timeframe of PhD studies. Longitudinal empirical data could provide great future research opportunities, especially from the standpoint of tension persistence and responses. The theoretical complexity of paradox theory, a conceptually evolving theory, brings some limitations to this research. Complex theory conceptualizations, such as the double-loop model of Berti and Pina e Cunha (2023) offer great theoretical insight but are hard to apply as complete models in the limited frame of an academic paper. It must also be noted that paradox theory is still nascent in supply chains, especially in LMD and city logistics research. Aside from deeper paradox explorations, future research should also look closer into different aspects of social sustainability within both LMD and city logistics. For example, vulnerable consumer groups' perspectives could be included in understanding accessibility issues and how they can be addressed. As this thesis shows, the paradox perspective can bring nuance and a better understanding of challenges such as sustainability. Thus, the theoretical perspective of paradox calls for more inquiries that utilize the theory. Power dynamics and salience perspectives warrant more research

within LMDs and city logistics. Regarding LMD and city logistics, service development aspects such as using LMD as an enabler for circular services and looking into social sustainability issues are areas in which future research will hopefully engage.

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APPENDIX

LIST OF ESSAYS

ESSAY 1

Heikkinen, H. (2024). Exploring how retail and logistics service provider managers make sense of sustainability in last mile delivery. *International Journal of Physical Distribution and Logistics Management* Vol 54, No 2, pp. 139-162.

ESSAY 2

Heikkinen, H. & Aminoff A. (2024). Exploring multiple levels of tensions impacting sustainability in e-grocery delivery (submitted to *Journal of Supply Chain Management*).

ESSAY 3

Heikkinen, H. & Aminoff A. (2024). How cities use power when facing tensions in sustainable city logistics development (to be submitted to *Transportation Research Part E: Logistics and Transportation Review*).

Note: The Essays 2 and 3 are available upon request from the author

Exploring how retail and logistics service provider managers make sense of sustainability in last mile delivery

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Abstract

Purpose – An increasing number of last mile deliveries (LMDs) pose many sustainability challenges that retailers and logistics service providers (LSPs) can address. Using cognitive frames (CFs) as a lens, this study explored how retail and LSP managers make sense of sustainable LMDs.

Design/methodology/approach – The methodological approach used is a multiple embedded case study. The data were obtained from interviews with retailers and LSPs, supplemented with secondary data for triangulation.

Findings – The findings present the operational aspects of LMDs that managers associate with sustainability and indicate that retail and LSP managers frame sustainability primarily as emission reduction. Managers indicate an externalization of responsibility and a compartmentalization of the supply chain, in which social sustainability is not associated with the last mile. Most managers indicate hierarchical CFs regarding sustainability, in which sustainability is an important topic but is subordinate to economic interests.

Practical implications – Collaboration between retailers, LSPs and other stakeholders is viewed as challenging but could alleviate some of the sustainability shortcomings and aid in the paradoxical framing and inclusion of social issues.

Originality/value – A conceptualization of managerial CFs for sustainable LMDs, together with empirical frame indicators and three propositions, is presented, providing novel insights into how paradoxical CFs could make LMDs more sustainable. This approach illuminates the possibilities for how to untangle the operational manifestations of managerial framing and adds to the empirical exploration of CFs in supply chain management.

Keywords Sensemaking, Cognitive frames, Environmental sustainability, Social sustainability, e-commerce, Urban logistics, Multiple case study

Paper type Research paper

1. Introduction

Last mile delivery (LMD), the last link of the supply chain in which an order is fulfilled for the end customer (Lim *et al.*, 2018), is a critical success factor for retailers (Hübner *et al.*, 2016). It is known to be complex and costly, posing many sustainability challenges. Some externalities involve pollution, congestion and accidents (Pourrahmani and Jaller, 2021), along with worker safety and health issues (Moncef and Monnet Dupuy, 2021). As retailers and logistics service providers (LSPs) are the main actors who execute LMDs (Huge-Brodin *et al.*, 2020), sustainability outcomes depend on both. Retailers play key roles that can influence

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sustainability because of their positions between the supplier and the end customer (Wilson, 2015) and LSPs are usually responsible for the sustainability aspect of deliveries (Huge-Brodin *et al.*, 2020). A certain awareness of sustainability is needed for a company to act upon implementing sustainability activities (Huge-Brodin *et al.*, 2020), and it is managers who make and implement decisions. As LMD complexity is increasing and delivery numbers are growing, accelerated by urbanization, e-commerce (Boysen *et al.*, 2021) and the COVID-19 pandemic (Ketchen and Craighead, 2020), the externalities caused by LMDs have become increasingly important to tackle. As retailers and LSPs are the two key actors executing LMDs, understanding what guides their sustainability actions is imperative.

Managerial views on sustainability matter, as they can impact operational outcomes and the managerial framing of sustainability issues can have unintended consequences (Hahn *et al.*, 2014). Therefore, a cognitive frame (CF) perspective can help understand how decisions regarding sustainability are made (Preuss and Fearne, 2022). CF is a "mental template that individuals impose on an information environment to give it form and meaning" (Walsh, 1995, p. 281). It is a tool for dealing with ambiguity and complexity signals (Hodgkinson and Healey, 2008; Walsh, 1995), and a paradoxical CF can aid a more nuanced sustainability understanding (Hahn *et al.*, 2014). Thus, this study uses a CF perspective to illuminate our understanding of how retail and LSP managers work to untangle the complexity of LMD sustainability challenges. This study aims to explore how managers make sense of sustainable LMDs. The research is an embedded multiple case studies that uses the conceptual CF work of Preuss and Fearne (2022) as a lens to explore the aim and answer the following research question:

RQ1. What CFs are indicated among retail and LSP managers when they make sense of their sustainable LMD operations?

This study offers a theoretically grounded analysis of the current managerial framing of sustainability in LMD. The findings of this study present the operational aspects of LMDs that managers associate with sustainability and the CF lens illuminates possibilities for how to start untangling operational manifestations. A conceptualization of CFs in sustainable LMDs is presented based on the empirical data, illustrating how the conceptual framework by Preuss and Fearne (2022) can be theorized as empirical frame indicators in a last mile context. This study also presents three propositions. The managers framed sustainability around CO_2 reduction, customer and market impact and collaboration. The framing of sustainability manifested in an ignorance of social sustainability in a last mile context. The managers also expressed an externalization of responsibility, in which customers and markets should carry responsibility for sustainability in LMDs and a tendency to reduce complexity in their understanding of sustainability. To address these challenges, this study suggests the need for paradoxical CFs to allow for a wider view of sustainability in LMDs, including more societal aspects and less operational compartmentalization.

2. Literature review

2.1 Sustainability in last mile delivery

In recent years, last mile research has become more focused on sustainability, as complexity has increased and global challenges concerning climate and social issues have become more topical. In the last mile scene, this has a direct implication for managers as company decision-makers. Table 1 illustrates the context by outlining examples of the multitude of sustainability challenges, including emissions, pollution, urban biodiversity, noise and related safety and health issues for workers, customers and city inhabitants alike. It is in this complex and often ambiguous environment, where issues such as payment models, collaboration concerns and upholding social values in new delivery schemes can cause conflicts between sustainability and business outcomes (Moncef and Monnet Dupuy, 2021),

	LMD challenge	Societal stakeholder	Sustainability aspect	Reference
1	Emissions and pollution A) Greenhouse gas emissions B) Air pollution/microparticles, including nitrogen oxide (NOX), PM10 (microparticles), and sulfur dioxide (SO_2)	Citizens/ society	Environmental	Browne *et al.* (2012), Garus *et al.* (2022), Ghaderi *et al.* (2022), Pourrahmani and Jaller (2021)
2	Energy efficiency of transport and the last mile as the most inefficient and energy-consuming part of the supply chain	Citizens/ society	Environmental	Garus *et al.* (2022), Halldórsson and Wehner (2020)
3	Clashes between urban transport and urban biodiversity	Citizens/ society	Environment	Sandström and Elander (2021)
4	Instant deliveries causing additional emissions and packaging	Citizens/ society	Environmental	Freitag and Kotzab (2020)
5	Noise levels and noise pollution	Citizens/ society	Environmental and social	Browne *et al.* (2012), Garus *et al.* (2022)
6	Traffic congestion and blocked traffic flows	Citizens/ society	Environmental and social	Browne *et al.* (2012), Pourrahmani and Jaller (2021), Simoni *et al.* (2020)
7	Environmental externalities causing social challenges in the form of health issues, such as disability, respiratory and cardiovascular diseases, sleep disturbances, and premature mortality in urban areas	Citizens/ society	Environmental and social	Browne *et al.* (2012)
8	Hazardous traffic and traffic accidents	Citizens/ society	Social	Pourrahmani and Jaller (2021), Tran *et al.* (2022)
9	LMDs impacting community development and land use and exerting pressure on city infrastructure	Citizens/ society	Social	Bissell (2020), Garus *et al.* (2022)
10	Equity and accessibility of LMD services, such as the available delivery times and opening hours that can cause segregation and the availability of deliveries to underprivileged populations	Customers	Social	de Oliveira *et al.* (2019), Garus *et al.* (2022), Ménascé (2014)
11	Technological exclusion when new technologies are adopted	Customers	Social	Garus *et al.* (2022)
12	Security of parcels and customers when picking up deliveries	Customers	Social	de Oliveira *et al.* (2019)
13	Safety of the workforce	Workforce	Social	Garus *et al.* (2022)
14	Working conditions, time pressure, and tight deadlines causing stress and potential risky behaviors for delivery workers	Workforce	Social	Boysen *et al.* (2021), Moncef and Monnet Dupuy (2021), Tran *et al.* (2022)
15	Country-specific work regulations that impact the working conditions for sharing economy delivery workers	Workforce	Social	Quadri (2021)

Source(s): Table by author

Table 1. Examples of sustainability challenges in LMDs

that managers need to make sense of sustainability. Sustainability challenges are made more complex by the transformation of LMDs and the many heterogeneous stakeholders involved (Mangano and Zenezini, 2019). The transformation of the last mile landscape refers to the introduction of innovations, such as drones and delivery robots (Boysen *et al.*, 2021), crowdsourcing and dynamic pricing (Mangiaracina *et al.*, 2019). Ambiguities are created when, for example, the use of delivery robots is both cost-efficient and green but creates social sustainability challenges involving safety and equity (Garus *et al.*, 2022). There are many different types of LMDs, such as home delivery, pick-up points and parcel lockers (Buldeo Rai *et al.*, 2019), so there are many sustainability considerations for managers. For example, the sustainability of different delivery methods is difficult to evaluate, as the environmental sustainability of LMDs depends partly on the degree to which the deliveries can substitute for customers' personal car travel and by which transport means the deliveries are organized (Bjørgen *et al.*, 2021). In addition, consumer preferences are changing (Villa and Monzón, 2021), underlining the importance of delivery speed (Bjørgen *et al.*, 2021). At the same time, consumers' possibilities to make green delivery decisions are impacted by the communication between LSPs and retailers (Sallnäs and Björklund, 2023).

Both retailers and LSPs play important roles in making LMD more sustainable (Bask *et al.*, 2016). However, retail and LSP interests might not converge when LSPs focus on cost reduction rather than environmental issues and when retailers are occupied with competing to satisfy customer needs (Kiba-Janiak *et al.*, 2021). Retailers have mostly been passive toward sustainable LMDs (Kudla and Klaas-Wissing, 2012); their interest in environmental issues seems to decline when criteria such as price, reliability and load factor take precedence, leaving sustainability aspects dependent on the LSPs (Huge-Brodin *et al.*, 2020). Retailers in end-consumer-oriented industries are more likely to be interested in and bring pressure to the sustainable activities of LSPs (Kudla and Klaas-Wissing, 2012), but many issues remain, as there is a lack of trust and knowledge sharing, which blocks the adoption of sustainable practices in the retailer–LSP relationship (Huge-Brodin *et al.*, 2020). With the several barriers to adopting sustainable practices, including organizational, financial, retailer–LSP market, retailer–consumer market, governmental and technological (Sallnäs and Björklund, 2023), there is a need to understand the subjective interpretations retailers and LSPs have (Reinecke *et al.*, 2023). As managers are primary stakeholders in the cascading effects impacting sustainability (Prataviera *et al.*, 2023), this study explores how managers make sense of sustainability in LMDs by using CFs as an analytical lens.

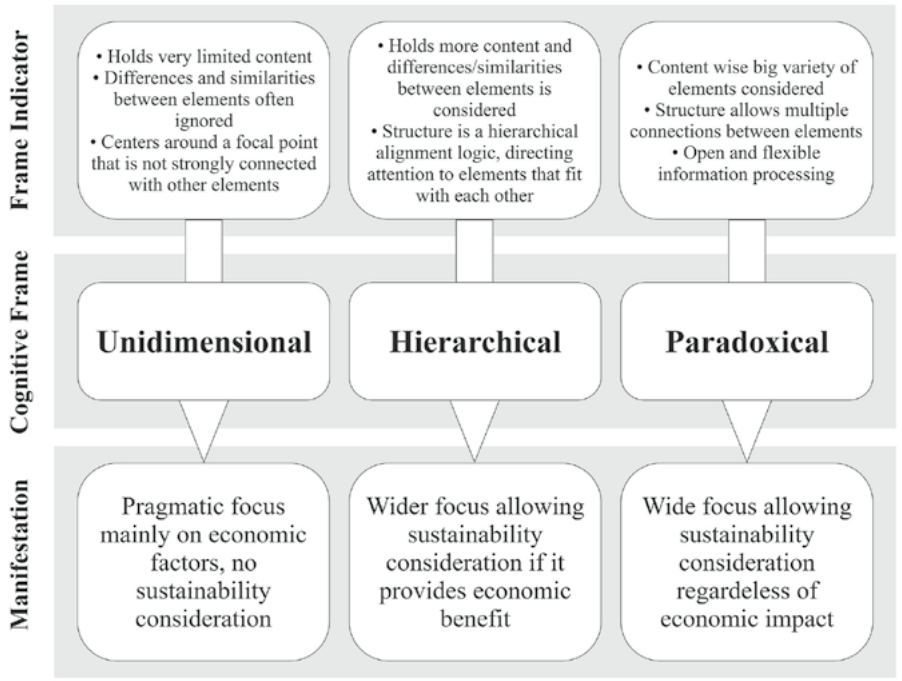
2.2 Managerial cognitive frames

There is a growing need to examine cognitive and behavioral aspects of supply chain management (Fahimnia *et al.*, 2019). CFs are part of sensemaking, i.e. the process of constructing meaning (Weick, 1995) and play crucial roles in managing sustainability tensions in organizations (Carmine and de Marchi, 2022). Depending on their CFs, individuals interpret information differently (Weick *et al.*, 2005). Managers use CFs to make sense of various complex and ambiguous signals (Hodgkinson and Healey, 2008; Walsh, 1995). Cognitive elements and their links make up a CF (Hayes-Roth, 1977). The complexity of a CF is impacted by its structure and content, as well as the interaction between these two (Preuss and Fearne, 2022). The content of a CF relates to the domain (Hahn *et al.*, 2014), such as sustainability, and the elements of the frame relate to how a person distinguishes or groups the attributes within this domain (Scott *et al.*, 1979). When looking at CFs, one should consider structure in the sense of content and logic (Hahn *et al.*, 2014). CFs are not static but change over time and are likely to become more complex as a person gains experience (Rousseau, 2001). CFs can therefore be both extended and transformed, as well as diffused within organizations, to become collective action frames (Benford and Snow, 2000). While CFs have been discussed as crucial for understanding the conditions under which companies can

address sustainability challenges in their supply chains (Corsini *et al.*, 2022; Hahn *et al.*, 2014; Preuss and Fearne, 2022; Xiao *et al.*, 2019), little is known about the CFs that retail and LSP managers hold in the context of LMDs or about their operational manifestations.

Decision-making is often viewed as a rational process, and the sensemaking part is neglected (Ericson, 2010), even if the process is entwined with sensemaking as an underlying dynamic (Boland, 2008; Ericson, 2010). Sensemaking provides the retrospective reflexive context and foundation for decision-making, and decision-making gives the direction and purpose necessary for navigating and making choices (Boland, 2008). When performing tasks, CFs provide managers with a structure for their assumptions and boundaries for what to include in their sensemaking (Smith and Tushman, 2005). Once CFs have been used to interpret an ambiguous environment, managers are likely to respond on that basis, leading to different sustainability decision-making processes (Hahn *et al.*, 2014). Therefore, the CF perspective constitutes an important viewpoint for exploring sustainability in LMDs. Building on previous sustainability-related CF conceptualizations by Hahn *et al.* (2014) and the work on integrative complexity by Suedfeld and Tetlock (1977), among others, Preuss and Fearne (2022) conceptualized three different CFs held by supply chain managers: *unidimensional*, *hierarchical* and *paradoxical*. In their conceptualization, adapted to a framework for this study (Figure 1), they illustrate how the CFs that managers hold make a difference in how they address sustainability challenges in the supply chain.

The framework presented in Figure 1 depicts the ideal conceptualizations used in this study as an analytical lens. A unidimensional frame is indicated by a narrow view, and it focuses on one core element, such as cost or economic gain. A manager with this frame will most likely not consider sustainability (Preuss and Fearne, 2022), and this "business-case"



Source(s): Adapted from Preuss and Fearne (2022)

Figure 1.
A framework for managerial cognitive frames

frame is deeply rooted among managers (Menon, 2022) and embedded in organizations (Cornelissen and Werner, 2014). A hierarchical CF is indicated by a supply chain manager who focuses on alignment and economic issues but is willing to consider additional dimensions of sustainability if these align with other interests (Preuss and Fearne, 2022). Paradoxical sensemaking is beneficial for learning, but convenience might prevent managers from adopting paradoxical sensemaking (Pinnington and Meehan, 2023). In a paradoxical frame, the structure of the frame includes many connections between the frame elements so that flexible information processing and openness to new information are possible (Hahn *et al.*, 2014; Suedfeld and Tetlock, 1977). In the case of a supply chain manager, a paradoxical frame allows multiple elements beyond cost or economic gains, making the manager aware of and likely to consider sustainability aspects regardless of their economic relevance (Preuss and Fearne, 2022). A paradoxical CF indicates that the manager can accept tensions between conflicting elements and can observe a wider variety of sustainability aspects; however, both time and other resources are needed for the manager to adopt a paradoxical CF (Hahn *et al.*, 2014). Effective replacement of a unidimensional CF necessitates sensebreaking to pave the way for adopting a new frame (Menon, 2022). To engage with the paradox, a manager needs to allow malleable categorial boundaries and appreciate differences, as well as act to solve tensions collaboratively (Sharma and Bansal, 2017). Sustainability is driven by company policy and strategy, but individual managers are responsible for the implementation process (Preuss and Fearne, 2022), so their CFs manifest in operations (Hahn *et al.*, 2014).

3. Research methodology

3.1 Embedded multiple case study

To explore how managers make sense of sustainable LMDs and what operational manifestations follow, this study adopted an embedded multiple case study approach to provide rich, nuanced data that can enhance the theoretical understanding of CFs in the last mile context. Case studies enable in-depth analyses and rich insights (Yin, 2018), and multiple case studies allow for the contrasting of results (Ellram, 1996). The focal point of the present study is the individual manager within an organization, but as Rousseau (2001) and Weick (1995) pointed out, there is a socialization aspect to cognitive processes. Therefore, managers can be seen as embedded cases within their respective organizations. The unit of analysis is the manifested sensemaking that can indicate the CF of a manager and thus explains how the manager makes sense of sustainable LMDs. The analytical lens is the framework in Figure 1, which is juxtaposed with the secondary data representing the organization's view on sustainability and the view presented in the literature.

3.2 Selection of cases and data collection

The selection criteria in this study followed a purposeful criterion logic to focus on information-rich and high-quality cases (Patton, 2002). The case companies were retailers and LSPs, as they jointly executed LMDs. Retailers in consumer-oriented businesses were chosen because they were more likely to be interested in the sustainable activities of LSPs (Kudla and Klaas-Wissing, 2012). Companies of different sizes with different product segments representing a variety of retail environments and with a substantial presence in e-commerce were selected. The interviews were conducted during autumn 2021 and spring 2022, and retailers were interviewed first. The LSP selection criteria were that they worked with the retailers interviewed and had substantial LMD experience. The case company was first selected, followed by the managers to be interviewed. The manager selection criteria were that they were operationally involved with LMDs and had significant work experience in e-commerce. In addition, the managers needed to have positions of such managerial

relevance that their opinions had strategic value within their organizations. These criteria were chosen because they implied that managerial CFs could be expected to have an impact on operations. All managers included in the study also shared the socio-political background and having working experience in European and Nordic organizations, so they could be assumed to share basic societal values. The managers were chosen to obtain rich information, and the selection of the appropriate respondents could be considered more important than their number (Saunders and Townsend, 2016). In this study, there were 13 cases: 8 retailers and 5 LSPs. An overview of the cases can be found in Table 2.

Semi-structured interviews were conducted to obtain new and previously unidentified insights (Patton, 2002). An interview guide was developed based on the last mile and sustainability literature, and feedback from other researchers was sought to ensure quality. The guide contained background questions to understand the professional background of the manager and the company, followed by questions about what the manager thinks about sustainability in LMDs, delivery strategies, general strategies and sustainability, as well as ad-hoc questions related to the respondents' answers. Each interview was recorded and transcribed. As the use of secondary data can strengthen theory building by triangulation of evidence (Eisenhardt, 1989) and enhance the validity of a study (Yin, 2018), secondary data were collected to obtain a thorough understanding of each case company (Eisenhardt, 1989). Special attention was given to capturing data sources that allowed for investigating a broader range of attitudinal and behavioral issues (Yin, 2018). For the retailers, observations that were captured in screenshots of what delivery options they offered at checkout were collected.

3.3 Coding and analysis

Cognitive processes and structures are not obvious to outsiders or even the persons themselves, but they can be identified from both reports and behaviors (Scott *et al.*, 1979). A simultaneous coding process, outlined in Figure 2, was utilized to explore the data. CFs are made up of two things: the *context-specific content* that can be described as attributes (Hahn *et al.*, 2014; Menon, 2022; Scott *et al.*, 1979) and the relationship between these attributes (Menon, 2022) that describe *the CF structure* (Hayes-Roth, 1977; Preuss and Fearne, 2022). Thus, the analysis process focused on simultaneously discerning between the CF context-specific content of the frames, here named *content domain* and the CF *structure*. The theoretical framework in Figure 1 provides three CF structures: unidimensional, hierarchical and paradoxical (Preuss and Fearne, 2022).

The context-specific *content domain* consists of elements that could be exemplified by specific operational activities to make LMDs sustainable, such as purchasing electric vehicles with the aim of emission reduction. Structural coding (Saldaña, 2009) was used in the first cycle to discern what content elements emerged from the data. As seen in Figure 2, these elements were grouped into themes utilizing pattern coding and further grouped into the CF *content domain* (Hahn *et al.*, 2014). The outcome of this process is visible in the results section in Figure 3. The content domain can be described as the operations that managers associate with sustainable LMDs. This content was compared to the areas of LMD sustainability found in the literature (Table 1) and to the secondary data to understand what content and topics were not mentioned.

As the content domain is intertwined with how a manager might make sense of it and associate the different content elements, a simultaneous process of understanding what *CF structures* could be indicated in the data took place. During the first cycle of coding, *in vivo* coding of quotes was used to capture the managers' languages, worldviews and perspectives (Saldaña, 2009). An abductive theory matching approach was then adopted (Dubois and Gadde, 2002) in coding cycle two to elaboratively match the *in vivo* quotes with the frame indicators in the theoretical framework (Figure 1). This analysis focused on determining

Case	Description	Respondent	Secondary data	Interview language
RER1	An international retail chain selling sports equipment and clothing. It has 5,000 stores with over 50,000 employees and an online presence in 42 countries. The HQ is in Switzerland	Director of E-commerce	Sustainability reports/ statements, CV, observation screenshots	English
RER2	An online food and grocery scale-up company from Finland that has a presence in three countries. The company is a small- and medium-sized enterprise with fewer than 200 employees	Founder (COO)	Sustainability reports/ statements, CV, observation screenshots	English
RER3	The grocery division of a Finnish daily consumer goods provider with over 20,000 employees that has a presence in eight countries	Logistics Manager	Sustainability reports/ statements, CV, observation screenshots	Finnish
RER4	A Nordic pet food and equipment chain with a presence in three countries. It is midsized, with fewer than 1,000 employees	Logistics Operations Manager	Sustainability reports/ statements, CV, observation screenshots	English
RER5	The grocery division of a Finnish daily consumer goods provider with over 40,000 employees and a presence in three countries	Manager of Grocery E-commerce	Sustainability reports/ statements, CV, observation screenshots	Finnish
RER6	A retailer of clothing and surplus goods with fewer than 200 employees. Its only stores are in Finland, but its online shop sells globally, with a strong focus on the US market	Supply Chain Director	Sustainability reports/ statements, CV, observation screenshots	English
RER7	A department and online store selling various products from clothing and cosmetics to electronics. It has fewer than 1,000 employees and sells online to 17 countries	Head of Logistics	Sustainability reports/ statements, CV, observation screenshots	Finnish
RER8	A Nordic electronics and whiteware retailer with fewer than 1,000 employees and a presence in six countries	COO	Sustainability reports/ statements, CV, observation screenshots	Finnish
LSP1	A Finnish-founded LSP that specializes in environment-friendly LMDs	Founder (CEO)	Sustainability reports/ statements, CV	Finnish
LSP2	An LSP focusing on scale-up LMDs and parcel lockers and has a strong technology focus in its development. The company has fewer than 500 employees and operates in five countries but is currently expanding operations in Europe	Head of Operations, Finland	Sustainability reports/ statements, CV	Finnish

Table 2.
Overview of the case companies

(*continued*)

Case	Description	Respondent	Secondary data	Interview language
LSP3	A logistics and mobility services company from Finland that operates in three countries and has fewer than 1,000 employees, but it also has a wide network of affiliated logistics partners	COO	Sustainability reports/ statements, CV	Finnish
LSP4	A Nordic logistics and postal services company that has expanded its delivery services in recent years and focuses on peer-to-peer deliveries. It has approximately 20,000 employees and operates in seven countries	Head of Distribution and Sorting	Sustainability reports/ statements, CV	Finnish
LSP5	An SME focusing on LMDs and consumer-oriented services. It currently operates only in Finland and has fewer than 200 employees	CEO	Sustainability reports/ statements, CV	Finnish

Source(s): Table by author

Table 2.

whether similar frame indicator logic could be found in the empirical data. It is important to note that the *in vivo* quotes functioned as a chain, in which logic, structure and associations emerged throughout the interview, not in a single quote. The connections between elements and themes that emerged in the content domain coding supported this process. The resulting *empirical frame indicators*, presented in Table 4, describe how the frame indicators in Figure 1 appear when managers make sense of sustainable LMDs.

3.4 Quality of research

The quality of the study was ensured through various measures reported in Table 3. Multiple sources of evidence were utilized and a chain of evidence was established through the theoretically derived interview guide and the structured coding process, ensuring construct validity (Ellram, 1996; Yin, 2018). Quotes were used to support the chain of evidence and to strengthen the most important findings (Stuart *et al.*, 2002). Objective data collection was feasible because of access to original data sources (Voss *et al.*, 2002). Preliminary results were presented to respondents and retail and LSP managers at a webinar to validate the findings.

4. Results

4.1 Operational manifestations of cognitive frames in sustainable LMDs

In this study, CFs are utilized as an analytical lens when describing the operative activities that managers associate with sustainable LMDs. This content seems to make up the content domains of a CF and can, in a last mile context, be categorized into three general themes: CO_2 and emission reduction, market impact and stakeholder collaboration (Figure 2). Analysis was also made about the content not described by the managers. It is apparent that environmental challenges are well acknowledged on a general level; however, the discussion lacks details and nuances that include, for example, biodiversity, and there is no discussion of air pollution or noise impact. Nevertheless, some positive impacts, such as LMDs being enablers of the circular economy, are highlighted. The managers did not include social

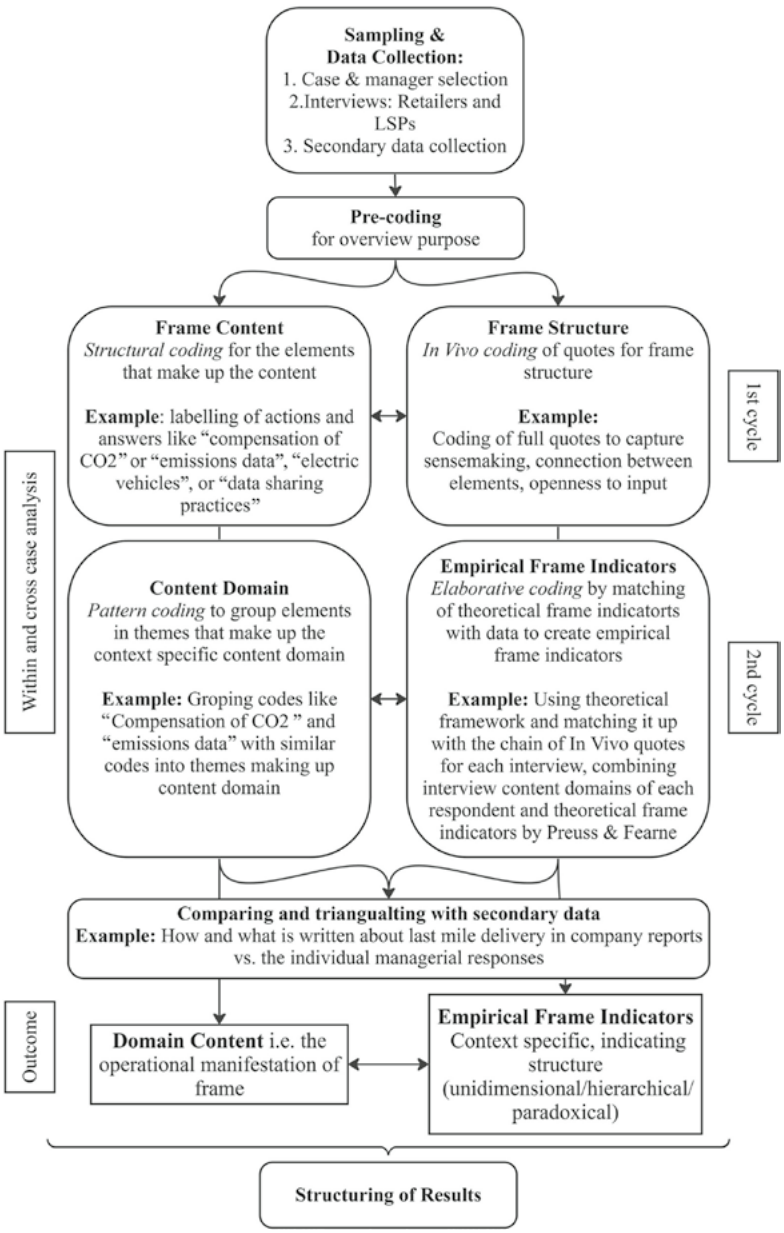


Figure 2.
Data collection and analysis process

sustainability aspects, such as accessibility for customers or the effects that LMDs can have on society at large.

4.1.1 Focus on emission reduction. Emissions were the most prominent sustainability theme for all managers. All respondents, except for LSP5 and RER3, outlined some types of emission reduction plans that their companies had adopted. LSP1 started its business with

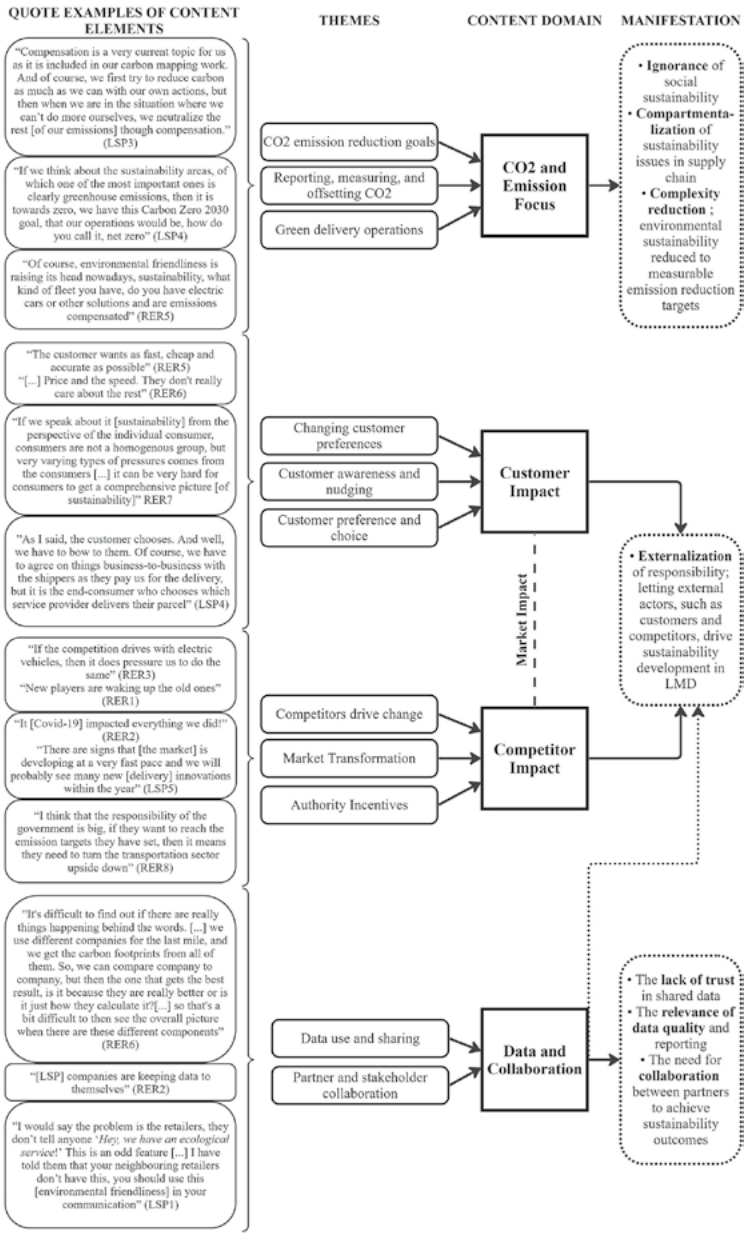


Figure 3.
The operative LMD sustainability actions structured in accordance with CF manifestation

the goal of providing only green delivery, and it strives to "continue improving toward infinity" to have carbon-negative operations one day. LSP4 is in the process of moving toward fossil-free transport and targeting "net zero." LSP2 refers to emission reduction being "in its DNA," while LSP3 aims at carbon neutrality by 2030. LSP5 stated that its customers were increasingly asking for emission data, but it has no reduction goals yet. RER1 acknowledged

	Quality measure implementation
Construct validity	• Theory and constructs were defined, and a theoretical framework was used for analysis • Feedback on coding schemes, theory implementation, and processes was sought from researchers not involved in the study • Triangulation of multiple data sources to corroborate the analysis • Analysis results were presented to respondents and retail/LSP experts at a webinar to validate findings
Internal validity	• Quality of evidence was achieved through a structured coding process to ensure pattern recognition provides consistency • Quotes were used to support the chain of evidence and strengthen the most important findings • Multiple data sources were used to reflect the lens of cognitive frames and corroborate the evidence • Rereading and recording the data in several iterative sessions—sequential analysis of data insights across all data sources • The context of the companies was verified through several documents • Interviews were conducted in the first language of the informants to ensure they were able to express their answers clearly and precisely • The interview guide was reviewed by fellow researchers for feedback • Objective data collection was feasible due to access to the original data sources
External validity	• Reporting of the structured and multi-stage iterative coding process to separate emerging themes and higher-order patterns • Based study in theory • Limitations were accounted for and discussed in the study • Triangulation of data and the use of multiple cases to aid generalizability
Reliability	• The research process was explained in the methods, aided by examples • Maintenance of a systematic case database of documents • Use of NVivo to ensure proper storage and management of data

Table 3.
Quality measures implemented

Source(s): Table by author

	Unidimensional	Hierarchical
Retailers	RER1, RER3	RER4, RER5, RER6, RER7, RER8
LSPs	LSP3, LSP5	LSP1, LSP2, LSP5
Empirical frame indicators	• Sustainability exists in strategy, but the relevance for LMDs is limited • Sustainability can become relevant if the market demands it (i.e. the economic imperative) • Customers are only interested in price and speed of delivery • Social sustainability is not relevant or interesting • Other actors are mainly seen as competitors; partners cannot always be trusted	• Sustainability, mainly CO_2 reduction, is relevant for LMDs • There is an interest in green values if they adhere to business interests or *eco-efficiency* thinking • Society, stakeholders, and customers are aware of and interested in environmental sustainability • Social sustainability is a concern downstream of the supply chain (retailers) • Other actors and partners are viewed as potential collaborators to achieve sustainability goals

Table 4.
The empirical frame indicators

Source(s): Table by author

emission reduction in the company strategy but mentioned no specific targets for logistics. RER2 wanted to offset all delivery emissions. The sustainability documents for both RER1 and RER3 outlined carbon neutrality targets for 2025, reducing emissions and offsetting when they could not be reduced through other means. RER3 did not mention these targets but said that they have standards for measuring and "know what they are driving with." RER4 expressed that it has set targets and has started collecting emission data since 2020. RER5 said that it was "very interested in all this [emission reduction] and was very willing to develop," which was in accordance with its company goal of reducing emissions by 90% by 2030. RER6 had a strong focus on carbon offsetting to achieve sustainability. RER7 was skeptical of carbon offsetting as a tool for emission reduction and said that the focus should be on reducing real operational emissions. RER8 said that it only has "eco-delivery" and that it does not engage in offsetting.

Sustainable LMDs were described as green delivery services. Optimization and efficient routing were mentioned in all the interviews as the main ways to reduce emissions, showing an affinity for *eco-efficiency* in which environmental and economic gains meet (York and Rosa, 2003). The respondents emphasized not driving in vain or with empty vans. Electrification of the fleet and the use of low-emission biofuels were also mentioned by all managers. For retailers, the cost of such options was still prevalent as an impacting factor. The use of environmentally friendly packaging, as well as renewable energy (e.g. solar panels) to power terminals, was viewed as part of green delivery. As components of sustainable LMDs, recycling and reverse logistics services, especially those that promote a circular economy, were mentioned by LSP4, LSP3, LSP5 and RER8. Varying from other responses, LSP5 said that offering consumer services that promote a circular economy constitutes LMD sustainability. This emphasis on green delivery was not present in the secondary materials of the retailers, even if transport and renewable energy sources were mentioned. The secondary data of LSP4, LSP3, RER3, RER5 and RER7 had very specific and clear emissions targets. Transport was seen as a source of emissions, but only RER7 specifically mentioned LMDs in its sustainability reporting. The link between the general sustainability goals in the secondary data and the managers' replies was rather weak. LMD was not seen as an integral part of the sustainability work but rather an operative function, and this separation was clear in all the data. There were contradictory answers regarding carbon offsetting and a slight contradiction between environmental and customer service values. For example, when asked about LMD priorities, LSP2 shifted between environmental values and the customer experience, expressing a tension in which it underlined environmental values but represented operations that were algorithmically honed toward customer experience.

No managers reflected on social sustainability without being prompted. When prompted, LSP1 queried, "Could you clarify what you mean by 'social sustainability'?" When asked, the managers described social sustainability as taking care of the health and well-being of the workforce. The retailers associated it with human rights issues downstream of the supply chain. Descriptions of social actions were vague, and the managers were quick to proceed to other topics. RER4 and RER5 touched upon social sustainability when discussing subcontractors and how it can affect the image of a company that buys its services. In this context, the managers were concerned about their own companies' images if they would be associated with the discussions on the working conditions that surrounded some LMD providers. Social sustainability was present as a topic in the sustainability strategies of retailers and LSPs, but the focus was on workforce well-being and, for the retailers, on human rights downstream of the supply chain. This indicates a compartmentalization in which social sustainability is seen as existing mainly in a certain supply chain context, not necessarily in LMDs.

4.1.2 Market impact, data and collaboration. Sustainability was seen as something that consumers should prioritize or a development that comes from competition or authorities. For retailers and, to some extent, LSPs, an externalization of responsibility was detectable. All case companies, except for LSP5 and RER1, showcased sustainability as a core strategy in their sustainability reports. Nevertheless, the retail managers indicated that it is customer demand, competition, or LSPs that must initiate sustainability actions. For example, RER2 thought that additional costs for green deliveries should be an additional service that customers could choose at checkout. Kiba-Janiak *et al.* (2021) noted that it is primarily retailers who should focus on end-customer needs. In this study, the end-consumer focus was essential for both retailers and LSPs, and customer experience was highlighted by both. Even if some managers thought that customers were increasingly interested in sustainability, all managers agreed that end customers prioritize price and speed. This indicates that LMD sustainability is framed as external, depending on customer demand. However, for example, retailers RER8, RER7, RER5 and RER2 acknowledged that they could nudge customers toward choosing more green delivery methods by placing certain delivery providers on top of the list at checkout. In terms of shipping options in online stores, only RER2 had one shipping option marked as sustainable, and there was no explanation for what constituted this sustainability. Even if customer experience was described at length, social sustainability issues, such as accessibility and safety, were not discussed in detail. LSP4 mentioned parcel safety, and LSP3 stated the geographical availability of services. In the secondary material, the customer experience was also highlighted. The secondary material of RER7 and LSP3 stressed the importance of inspiring customers toward sustainable consumption, emphasizing customers' responsibility to be sustainable, illustrating where the managerial and organizational framing seem to converge. RER6 stated that it does not offer free delivery to its customers, as this would make them order "unnecessary stuff."

All managers were aware of the current transformation of LMDs and mentioned that competition was becoming tougher. Increased technology use was mentioned in all interviews. The managers were keen on benchmarking their operations with competitors and emphasized how sustainable LMDs can be sources of competitive advantage. The actions of cities, municipalities and other authorities were also seen as impacting sustainability developments in LMDs. Practical challenges, such as parking spaces, were something that cities could improve. LSP5 predicted that cities would create lower emission zones and RER8 thought that the government should take more tangible actions regarding the transport sector to reduce emissions.

LSPs faced increasing demands from their clientele to provide emission reporting. However, emission data sharing and accuracy were sources of tension between retailers and LSPs. RER6 and RER7 felt that LSPs might withhold emission data and missing measurement standards increase mistrust. LSP1, on the other hand, was frustrated that retailers did not communicate the data shared with them with end consumers. All LSPs said that they provided emission reports to retailers. As the execution of LMDs is a joint activity for retailers and LSPs, there are also elements of externalization toward the respective retail/LSP partners. In the interviews, the actuality that sustainability is a general phenomenon affecting all of society was accentuated in the way the managers talked about collaboration with stakeholders. Customers and partners were focal, but authorities and other organizations, such as certification bodies, were also mentioned. Reporting standards and certification were topics that materialized in the secondary data and were mentioned as tools for transparency and collaboration. Previously, it has been concluded that retailers are passive regarding LMD sustainability (Kudla and Klaas-Wissing, 2012), while most of the responsibility has been given to LSPs (Huge-Brodin *et al.*, 2020). However, this study suggests that retailers do not feel they have full control but do have an interest in taking active roles in sustainable LMDs.

4.2 Empirical frame indicators in sustainable LMDs

This section is a theoretically grounded description of the empirically derived frame indicators that describe how managers make sense of sustainability in LMDs. This section presents the CFs that the data indicate managers hold when making sense of sustainable LMDs. Empirical frame indicators were developed based on the theoretical framework (Figure 1) to discern the content and structure that could indicate a CF in a last mile context. These indicators, manifested in the sustainability actions and observed in the data, are presented in Table 4, together with a grouping of managers in accordance with how they seem to frame sustainable LMDs. For both retailers and LSPs, the main CF content considers environmental sustainability, paired with aligned topics that support the balance between business interests and emission reduction goals. The CF content domains (Figure 2) of all managers remained similar, but the relative importance of activities, the way content was discussed, and the importance of sustainability activities varied in accordance with either a more unidimensional or hierarchical structure.

Out of 12 managers, 8 indicated predominantly *hierarchical CFs*, in which sustainability is an important topic but is subordinate to economic interests. Four managers indicated thinking that aligned with *unidimensional CFs*. Although some managers acknowledged the complexities, none of the respondents could be said to indicate paradoxical CFs regarding sustainable LMDs. Common for the managers indicating *unidimensional CFs* was focusing on LMD optimization for profit reasons rather than environmental considerations. They all shared instrumental and profit-driven views of LMDs and had little interest in sustainability. They also tended to view other actors and stakeholders more as competitors than as partners. Common among managers indicating *hierarchical CFs* was that their companies had sustainability as one of their core values, but the operational execution showed that economic interest was prioritized, even if the managers themselves acknowledged the importance of environmental sustainability. These managers had more positive views of stakeholders as sustainability collaborators. There was no notable variation in content or structure that would differentiate between LSPs and retail managers.

5. Discussion

As the literature depicts, the LMD scene is undergoing a transformation. In addition, ambiguities are created by the complexity of sustainability challenges. The value of using CFs as a lens in this context lies in the possibility of understanding the underlying sensemaking that forms the basis for decision-making, as managers use their CFs to reduce complexity and ambiguity (Porac and Thomas, 2002; Walsh, 1995). As managers are key stakeholders in the cascading effects that impact sustainability practices in organizations (Prataviera *et al.*, 2023), this study shows what operational aspects are associated with sustainable LMDs and how CFs as a lens can guide the discussion on how sensemaking manifests in operational activities. The examples from previous literature compiled in Table 1 illustrate how ambiguity and complexity is created by the multifaceted sustainability challenges, including noise, pollution, emission and biodiversity concerns, as well as social considerations for both customers, workers, and society at large. Using the framing perspective, this study shows that even though these nuances are available in literature, in an LMD context, managers are primarily concerned with environmental concerns in the form of CO2 measurement and reduction. As the framing is either unidimensional or hierarchical, these considerations do not seem to leave space for the complexity that previous research illustrates. Figure 4 conceptualizes how the content and structure of managerial CFs appear when managers make sense of sustainable LMDs. In Figure 4, the ideal-type frames (unidimensional, hierarchical and paradoxical) have been organized in accordance with their operational content domain, as presented in the results. In the results, the unidimensional

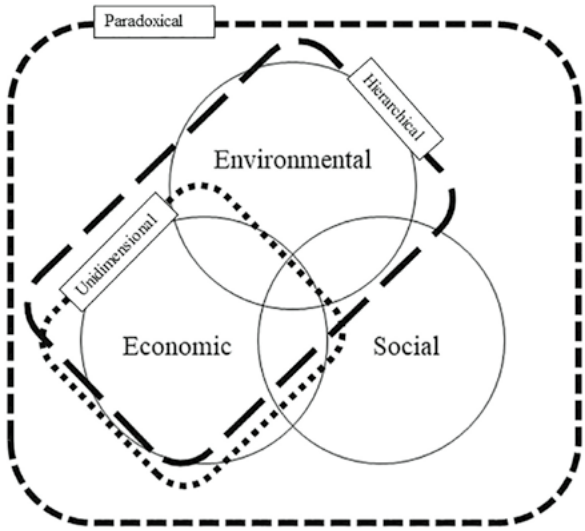


Figure 4.
A conceptualization of managerial cognitive frames in sustainable LMDs

frame has been indicated by a pragmatic profit-focused stance on LMDs, while the hierarchical frame has extended the view through eco-efficiency thinking and an emphasis on environmental values and emission reduction schemes, but both CFs have largely ignored social sustainability. This could partly be due to the retrospective nature of sensemaking (Boland, 2008; Choo, 2002), which highlights the emergence of activities that could be described as generic responses to sustainability. This study suggests that paradoxical CFs and acknowledging a broader spectrum of sustainability challenges could be necessities for company LMD operations to become more sustainable. For this to happen, managerial CFs must broaden in scope and nuance, indicating the need for deliberate sensebreaking (Menon, 2022) to enable a paradoxical frame.

A paradoxical CF is likely to hold a more complex structure and more cross-associated elements, thus the possibility of thinking about LMDs from a wider perspective. Some retailers discussed image issues relating to logistics subcontracting, focusing on the impact that social issues had on their companies' images rather than incorporating these in how they work with LMDs. The retailers mentioned that social issues exist downstream of the supply chain, compartmentalizing the supply chain in terms of sustainability. In a supply chain context, previous CF research has found that it is convenient for managers to distance themselves from social sustainability challenges, as they present as paradoxical and ambiguous (Pinnington and Meehan, 2023). This lack of social consideration can also be exemplified by the discussion about parking. Parking was considered an issue for LMDs and was framed as a blocker for operations, not as a hindrance for citizens. A paradoxical CF demands accepting the coexistence of contradictory demands and ambiguity (Smith and Tushman, 2005) and manifests through a widened understanding of and explicit attention to sustainability (Preuss and Fearne, 2022). In the light of the findings, one example of a paradoxical framing could be acknowledging the societal aspect of parking that includes not only the viewpoint of LMD execution but also the of societal impact. When LMD research is reviewed, the societal perspective is evident, as can be seen in Table 1. However, for this type of societal acknowledgment to happen, a manager would need to be more reflexive and to associate a wider range of sustainability issues with LMDs.

A paradoxical CF could enable this type of thinking because paradoxical CF frame indicators suggest a larger variety of considered elements and multiple connections between them (Hahn *et al.*, 2014; Preuss and Fearne, 2022). Taking a critical look at social sustainability has been identified as a research need in LMDs (Moncef and Monnet Dupuy, 2021). It is not likely that social sustainability issues will be addressed if managers do not associate them with LMDs. Thus, the following propositions are suggested:

P1a. Sustainability in LMD is framed as environmental sustainability by managers.

P1b. A more paradoxical view of sustainable LMDs is needed to consider the complexity of social sustainability in parallel with economic and environmental aspects.

The framework by Preuss and Fearne (2022) does not specifically mandate social or any other aspects to be included in a paradoxical frame, as the conceptualization presents ideal types. Nonetheless, empirical studies can provide nuanced context-specific insights into how managers frame operational aspects. As proposition one suggests, the managerial framing was predominantly environmental, and in the light of the examples found in literature, also many environmental considerations, such as microplastics or pollution were mostly ignored. A paradoxical frame could indeed deepen the understanding and consideration of all sustainability aspects, not just the social one. But the absence social considerations highlights the managerial importance of the study findings and theorizes the possibilities of a paradoxical framing that seems to be lacking at this moment. It is to be expected that not many managers have paradoxical frames and that managers who hold them are pioneering types (Hahn *et al.*, 2014). It was only LSP1, the founder of a small LSP built on the premise of environmental sustainability, that indicated paradoxical thinking around environmental sustainability. An argument could be made for placing LSP1 in the paradoxical category because, compared with the other respondents, this manager was willing to place environmental sustainability as equal to profit and as a baseline for LMDs. However, the frame held by the manager could also be seen as a hierarchical frame, as the operations were based on environmental values, but the main priority was successful business. It was also clear that this manager did not consider social sustainability to be part of LMDs. Usually, the worldview of companies tends to separate society and business and to treat events as isolated, not part of a larger system view that sustainability complexities and paradoxes would require (Slawinski and Bansal, 2015). In this study, the LMD sustainability content domain of both a unidimensional and hierarchical CF seems to create a sort of tunnel vision, which is expressed as eco-efficiency. From the results, it is nonetheless positive to note that some elements of paradoxical thinking could be distinguished by including circular economy services as positive environmental outcomes of LMD. Sharma and Bansal (2017) suggested that flexible cognition is needed to engage ambiguity and Corsini *et al.* (2022) concluded that integrative CFs can stimulate the adoption of circular economy practices. In the LMD context, a paradoxical framing that supports operational actions is needed to widen the scope so that social sustainability issues, such as the accessibility and safety of customers and society, as well as more nuance and environmental considerations, such as biodiversity, are included, as these aspects have been highlighted by previous research as important sustainability considerations for LMD.

Preuss and Fearne (2022) noted that multifunctional and diverse experiences, as well as industrial norms, can foster paradoxical thinking and influence the CFs of managers. This supports the idea that exposing managers to a wider variety of experiences and perspectives, for example, through collaborative stakeholder efforts, could enhance paradoxical thinking. In addition, an important aspect is managers as part of their organizations and LMDs as cooperative functions between retailers and LSPs. Organizational socialization (Rousseau, 2001) affects managers' CFs, which can transform or blend over time (Cornelissen and

Werner, 2014). The results show a manifestation of externalization in which managers want other instances to drive sustainable LMD development. In this context, the influence of socialization on CFs means that collaboration could enhance paradoxical thinking. However, managers indicating unidimensional CFs were especially protective of their operations and expressed mistrust toward their partners. Managers did not engage in paradoxical thinking that could allow for the inclusion of several simultaneous and different stakeholder perspectives on how they work with sustainable LMDs. Paradoxical CFs could unleash the potential of data, collaboration and customer impact in making LMDs more sustainable and including a multitude of externalities and stakeholders. Positive change could be possible over time; as Benford and Snow (2000) noted that CFs can be tools for organizational change. As organizational socialization was not within the scope of this study, these lines of inquiry warrant further research. Based on the empirical indications in this study, the following proposition is presented to support further exploration:

P2. Deeper retailer and LSP collaboration could offer pathways to a more profound integration of sustainability and paradoxical framing in LMD.

With the many barriers posed for adopting sustainable practices, such as governmental, technological and market-based (Sallnäs and Björklund, 2023), it is positive to note how data and collaboration emerged in the study data as key content domains. In the heterogenous stakeholder environment that constitutes LMD (Mangano and Zenezini, 2019), complex challenges such as accessibility (de Oliveira *et al.*, 2019) or technological exclusion (Garus *et al.*, 2022) or country-specific regulation (Quadri, 2021) would most likely need collaborative efforts to be addressed. Thus this study provides novel insights about why LSP–retailer collaboration could help managers find wider perspectives (Preuss and Fearne, 2022) as well as learning opportunities (Pinnington and Meehan, 2023) that foster paradoxical framing in an LMD context.

As the results show, in terms of sustainability, managers frame LMD in operational rather than strategic terms. This indicates that LMD is not likely to be placed strategically in any internal sustainability discussions, as is also visible in the secondary data. The absence of LMD as a strategic topic underlines the importance of investigating sustainability in LMD from varying viewpoints. For example, Sallnäs and Björklund (2023) have identified several barriers to environmental sustainability in e-commerce that are important for both researchers and managers to acknowledge. This research adds to the barrier perspective by providing more nuanced findings on the managerial framing of sustainability, namely, an externalization of responsibility toward the customer and market, a compartmentalization of the last mile from the wider supply chain and a tendency toward complexity reduction in environmental sustainability matters that manifest as a focus on CO_2 offsetting or CO_2 emissions. This tendency seems to converge with research in a different supply chain context, where managers adopt a narrow perspective when they struggle to make sense of complexities, manifesting in avoidance of immediate action (Pinnington and Meehan, 2023). Following this line of argumentation, this study proposes the following:

P3. The prevailing framing of sustainability in LMDs:

P3a. Manifests as an externalization of sustainability responsibility toward consumers and partners.

P3b. Manifests as a compartmentalization of LMD from the supply chain.

P3c. Manifests as a complexity reduction of environmental sustainability to measurable emission reduction targets.

A fundamental challenge in paradox discussions is that teaching paradoxical thinking requires the determination of what that paradox entails in each context (Schad *et al.*, 2016). This research describes the prevailing status of sustainability in LMDs and identifies where managerial sensebreaking could potentially take place. Previous LMD sustainability research has painted a complex picture of the sustainability challenges involved (Table 1). This study and its propositions highlight the potential role of managerial sensemaking as a crucial component in addressing the complex and occasionally paradoxical sustainability challenges within LMDs. It contributes by shedding light on the importance of internalizing sustainability responsibility in LMD operations and better integrating the last mile in the supply chain. As paradoxical framing requires experiential learning (Miron-Spektor *et al.*, 2022), discerning the operational activities currently involved in making LMD sustainable constitutes a managerial contribution and a ground for future longitudinal inquiry that considers the dynamics nature of CFs.

6. Conclusion

The study contributes by theorizing research and empirical data in an explorative manner to better understand what CFs for sustainability in LMDs could entail. The analysis is a conceptually rooted delineation of how managers make sense of sustainability in LMDs and contributes to a more nuanced discussion in the operationally oriented last mile research context. This study also contributes to the literature by offering a conceptualization of CFs in sustainable LMDs, exploring the operational content domains and offering empirical frame indicators for the last mile context. Out of 13 managers, 8 indicated hierarchical CFs, in which sustainability is an important topic but is subordinate to economic interests. Five managers indicated sensemaking that aligned with unidimensional CFs. Even if paradoxical thinking emerged in the data, no manager could be said to have a paradoxical CF. The findings reveal that managers framed sustainable LMDs around the topics of emission reduction, market impact and collaboration. It seems social sustainability aspects are largely ignored and responsibility for sustainable development is seen as external, something customers or market actors should spearhead. There were indications of complexity reduction regarding environmental sustainability and a compartmentalization of the last mile from the wider supply chain. It is not likely for social sustainability issues to be attended to in LMDs unless managers consider them part of their LMD sustainability work. Paradoxical CFs acknowledging the variety and complexity of sustainability issues involved in LMDs could be necessary to include more operational measures that tackle social and environmental sustainability challenges.

For managerial practice, this indicates the need to acknowledge the cognition perspective in decision-making, allowing time and resources, as well as opportunities, for cross-functional and industrial discussions that can foster paradoxical CFs. The managerial contribution highlights the need for sensebreaking and shows how paradoxical CFs could provide new pathways to understanding sustainability in operational decision-making. As paradoxical CFs can aid in problem-solving and a better understanding of the integration of social sustainability in LMDs, this research contributes to managerial learnings on understanding what paradoxical framing can mean in an LMD setting.

6.1 Limitations and future research

Current research on paradoxes widely shares the assumption that paradoxical frames or mindsets are of benefit to organizations. While this study adheres to this assumption, it can be noted that there is research indicating otherwise. The geographical context of this study, which is primarily Nordic, accounts for some study limitations and might influence the

content domains of managerial CFs. The Nordic welfare context might impact managers' views of social sustainability. This study is also limited to individual managerial frames and provides a situational snapshot. The dynamic process of CFs that are likely to change over time is a limitation of this study. Further research could consider the evolving dynamics of CFs and sensemaking over time and under varying conditions through conducting longitudinal studies with contextual data and alternate data collection techniques. As CFs are malleable and can blend or transition (Cornelissen and Werner, 2014) or can function as mediators for organizational or social change (Benford and Snow, 2000), the socialization and organizational perspectives of CFs within LMDs and their impacts on sustainability provide ample opportunities for further research.

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HELLEKE HEIKKINEN

Last but not Least: A Paradoxical Sustainability Exploration in Last Mile Delivery and City Logistics

As societal challenges increase and business practices evolve, this thesis invites readers to rethink sustainability in the context of last-mile delivery (LMD) and city logistics. It is a call to action for managers, policymakers, and researchers to engage in joint discussions and embrace a paradoxical approach to sustainability.

In an era of urbanization and e-commerce, the significance of LMDs and city logistics is pronounced. This thesis delves into the intricate world of LMD and city logistics, arguing that while LMD may be the final link in the supply chain, it is far from the least important. Amidst the surge of online shopping during the Covid-19 pandemic, LMD has soared to new heights, bringing with it a host of challenges. This delivery surge is crucial for e-commerce retailers and profoundly impacts cities and non-urban communities. The rise in delivery and city freight traffic brings with it a corresponding increase in emissions and a host of other challenges. These issues are particularly pressing at a time when sustainability is a key concern for city authorities, companies, and individual consumers alike. The growing focus on sustainability comes as society and businesses confront the stark realities of climate change, biodiversity loss, and numerous other grand societal challenges. These challenges often present contradictory demands on various business sectors, making it essential to find a balance that addresses both environmental and social sustainability. As such, the role of sustainability in LMD and city logistics is becoming ever more critical, requiring innovative solutions and collaborative efforts to mitigate impacts.

Through the three essays in this thesis, the research examines the multifaceted nature of sustainability in LMD and city logistics. Essay 1 highlights the managerial focus on emission reduction and calls for a broader, paradoxical framing of sustainability. Essay 2 integrates discussions on tensions across individual, organizational, and systemic levels, emphasizing their interconnectedness and impact on sustainability. Essay 3 addresses the role of cities in sustainable logistics, exploring the power dynamics and ambiguities that shape their involvement. This thesis proposes a paradoxical understanding of sustainability, where seemingly conflicting elements must coexist. It explores how organizations can approach LMD and city logistics while embracing broader sustainability goals beyond emission reductions. The thesis emphasizes the need for a paradoxical approach to sustainability, considering both environmental and social aspects and the importance of power dynamics in achieving sustainable LMD and city logistics. It argues that true sustainability in LMD and city logistics requires acknowledging and addressing the tensions and contradictions inherent in these contexts. Doing so opens the door to more inclusive and effective sustainability practices that integrate environmental, social, and economic dimensions.

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