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## Article

# Delivering Goods Using a Baby Pram: The Sustainability of Last-Mile Logistics Business Models

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**Abstract:** This study compares the differences in the attitudes of last-mile delivery companies operating with different business models toward economic, environmental, and social sustainability. The economic perspective focuses on productivity, the environment, and social sustainability, and where the environment and social sustainability are concerned, on carbon neutrality goals and means, and on what societal factors companies consider important, respectively. In this multi-case qualitative study, a literature review was carried out and 11 semi-structured expert interviews were conducted in companies representing three business model categories: crowdshipping companies, last-mile providers, and traditional logistics service providers. Based on this study, crowdshipping and last-mile companies were largely loss making, whereas logistics service providers were profitable. The first two groups invest heavily in growth, which explains the loss. All logistics service providers, half of the last-mile providers, and no crowdshipping companies set a carbon neutrality target. The biggest difference in environmental measures comes from the fact that in the crowdshipping business model deliveries are performed partly in conjunction with other travel, emphasizing job creation in society and freedom of work. In contrast, the last-mile and traditional logistics companies emphasized the responsibilities of the employer. For the scientific community, this study provides new insights into the subject from the perspective of different business models. For management, this research provides insight into the views of other companies that can be utilized in future decision making. For example, if the legislation of crowdshipping becomes clearer, then traditional companies could consider using it in their own operations to overcome labor shortages.

**Keywords:** last mile; last mile logistics; sustainability; responsibility; crowdshipping; crowdsourced delivery; logistics service provider; stakeholder; business models; e-commerce



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## 1. Introduction

The last part of the supply chain, the so called “last-mile”, is a bottleneck of e-commerce logistics [1]. It poses major economic and environmental challenges for retail e-commerce, which grew by 28 percent in 2020 and is projected to grow by 50 percent from 2020 to 2024 [2]. Gaevers et al. [3] state that the last-mile as one of the most expensive, least efficient, and most polluting part of the supply chain. The EU aims to reduce net greenhouse gas emissions by 55 percent by 2030 compared to 1990 levels [4], and reducing emissions over the last-mile is critical as urban freight is responsible for 25 percent of urban-related CO<sub>2</sub> emissions [5]. According to Boysen et al. [6], the term “last-mile” refers to all those logistical activities related to the distribution of shipments, e.g., parcels with goods ordered online to private customer households in urban areas. Typical features of last-mile logistics are small shipment size, high delivery frequency and speed, and a less predictable order profile [7]. Last-mile delivery is one of the areas of urban freight transport (UFT) [8] and the term sustainable urban freight transport (SUFT) [9,10] is used when emphasizing sustainability.

The growth of last-mile deliveries has given rise to various business models. Traditional logistics service providers (LSP), such as national postal operators, Schenker, and DHL, are companies which perform logistics activities on behalf of others [11]. Alongside

this, crowdshipping companies (CS), such as Deliveroo, Postmates, Doordash, Instacart and Amazon Flex, have emerged [12]. In them, ordinary people carry out last-mile deliveries with their own vehicles from stores or warehouses to customer destinations [13,14]. Other used terms are, e.g., crowdsourced delivery, cargo hitching, collaborative logistics, and crowd logistics [15]. In addition to LSP and CS companies, there are parcel specialist companies [16], referred to as last-mile providers (LM), such as MoveByBike, Budbee, and Instabox, which focus only on last-mile deliveries. Operationally, these companies are closer to CS companies because they both focus on last-mile delivery. From a workforce perspective, LM providers are closer to a traditional LSPs, as deliveries are handled by employees rather than self-employed couriers.

In the literature, sustainable last-mile deliveries have been studied from the perspective of various stakeholders, such as local government, shippers and retailers, residents, online customers, and transport companies [8]. According to Maja et al. [8], the sustainability of transport companies has been studied in the parcel sector, transportation planning in cities, delivery and distribution planning and optimization, autonomous/electric/robotic vehicles, and IT solution implementations. Research on sustainability focuses on environmental sustainability [17], whereas social and economic sustainability receive less attention. Regarding transport companies, more research is needed on how companies position themselves toward sustainability. Moreover, previous studies have not dealt with how the attitudes and emphasis of different business models of transport and last-mile delivery companies differ from each other. This study aims to fill these research gaps.

The aim of this article is to compare the differences in the attitudes and emphases of last-mile delivery companies operating with different business models to economic, environmental, and social sustainability in Finland. The studied business models are crowdshipping, last-mile providers, and traditional logistics service providers. Four research questions were formed for this purpose.

1. How does the newer last-mile delivery business model's approach to profitability differ from the traditional business model?
2. Have the companies with different business models set themselves a goal of carbon neutrality and how ambitious are they?
3. How does their business model affect the means to achieve environmental sustainability?
4. How do crowdshipping companies' attitudes and emphasis on social sustainability differ from other transport companies and how do they affect labor availability?

This paper covers a literature discussion in the second section. The third section details the materials and methods while the fourth section introduces results of the study. The fifth section discusses these findings, and the sixth section concludes the article with the main findings and recommendations for future research.

## 2. Literature Review

Sustainable logistics strives to improve economic, environmental, and societal interests concurrently. These three perspectives are also called profit, planet, and people [18]. Profit refers to the profitability of a company in the short and long run, planet refers the impact of a company on the environment and its use of resources, and people refers to equity, well-being, and health of a company's clients and stakeholders as well as its workforce and suppliers [18].

### 2.1. Economic Sustainability

Various studies look at the share of last-mile costs in the entire supply chain. According to Vanelslander et al. [19], the last mile can account for half of the total cost, whereas another study reports a share of 41 percent [20]. Measured in monetary terms, the global average cost per last-mile delivery was 10.1 US dollars in 2018, while the client was billed an average of 8.1 US dollars [20]. Studies have emphasized the importance of delivery price of on-demand deliveries [21] and dynamic pricing policies [22].

Optimization of the distribution route [23,24] and the use of a mobile depot [25] or microhubs [26] have been raised as profitability factors. Crowdshipping has been introduced as an innovative solution for a faster, more personal, and cost-effective delivery service [27]. Technologically innovative solutions, such as drone delivery [28], delivery to the trunk of the customer's car [7], and autonomous delivery robots [29], have also been proposed.

There are also simulation studies comparing the profitability of CS operations to the traditional business model. Both Arslan et al. [30], Devari et al. [31], Seghezzi et al. [32], and Lin et al. [33] compare the efficiency of CS delivery with a traditional model where delivery is handled by dedicated drivers. All these studies suggest that the CS model is promising in terms of efficiency compared to traditional operations.

### 2.2. Environmental Sustainability

Last-mile logistics can have several negative environmental impacts and is therefore one of the major concerns in developing sustainable cities [34]. Last-mile operations add to CO<sub>2</sub> emissions and the consequences of local air and noise pollution in urban environments [35]. To develop environmentally sustainable urban freight transport, many new technologies and innovative last-mile logistical solutions have been introduced, such as parcel boxes, collection and delivery points, and lockers [9,22,36–39]. The use of light goods vehicles for parcel deliveries has also increased especially due to growth in e-commerce [40]. Arnold et al. [41] state that cargo bikes as a distribution solution provides not just reduced environmental impacts but also flexibility. Continuous technological development with the aim of achieving green logistics targets has also led to an increasing use of electric vehicles and other alternatively-fueled vehicles in urban areas [42,43].

Evangelista et al. [44] studied how environmental sustainability is embedded in the LSP culture and organization by interviewing 10 LSPs in Italy and the UK. Based on their research, there are gaps in both the awareness of the importance of environmental sustainability and a clear approach to the implementation of the environmentally sustainable development strategy.

Crowdshipping has the potential to be one of the most effective ways to decrease both resource use and environmental impacts through using the loading space more efficiently, reducing traffic, congestion, and polluting emissions [45,46]. Dupljanin et al. [47] emphasize that bicycle-based crowdsourced fleets are more environmentally friendly than traditional car-based fleets or fleets that rely on both cars and bicycles. Binetti et al. [45] suggest that bike-sharing systems in cities could be utilized as well in CS deliveries. In Finland, one study examined the use of a CS model in library deliveries through a trial, finding that environmental emissions could be reduced [48].

For the development of sustainable urban delivery, route optimization, maximizing capacity utilization, night deliveries, delivery time windows, and urban emission zones have been proposed [34,49]. Different distribution strategies such as a centralized distribution network with a click-and-collect option and a decentralized distribution network with home-delivery are also introduced as tools for exploring the sustainability potential of last-mile logistics [50]. Carbon footprint calculations and reporting emissions of deliveries also provide valuable information when aiming to reach sustainability targets [51].

### 2.3. Social Sustainability

Regarding social sustainability, one study highlights urban congestion in terms of numerous delivery vehicles in inner cities as a negative aspect of e-commerce growth [52]. A few studies look at the issue from the perspective of a crowdshipping business model. In 2022, Kusk and Bossen [53] published an ethnographic study in which they studied the attitude of Wolt couriers to algorithm management in Denmark. The study revealed that Wolt's way of using algorithms is more lenient than harsh. On average, couriers were satisfied with their work and the use of algorithms as part of management. The result differs from the survey conducted for Uber couriers, where algorithm management was perceived

as negative [54]. In other crowdshipping studies, creating a job in society [55], [56], and the freedom to work at a time and to a scale that suits you [27] have been found to be positive. Moreover, the possibility of turning one's own time and one's own abilities into income has been seen as positive [57]. Negative factors relate to the entrepreneurial nature of platform work, such as job insecurity, unstable income [58], lack of health insurance or retirement benefits [55], and low protection of working conditions [59].

### 3. Materials and Methods

The purpose of this article is to compare the differences in the attitudes and emphases of last-mile delivery companies operating with different business models for sustainability in Finland. A multi-case qualitative study was chosen as a research strategy. The case study is an in-depth study into a subject within its real-life setting [60]. It is well suited to situations where the topic has not yet been studied much or a fresh perspective is sought on a previously researched topic [61], as is the case in this study. The multi-case study, which includes two or more cases to investigate the same phenomena, is a good method to compare the similarities and differences between cases, and whether the findings can be replicated [60,62]. This study was carried out using both a literature review and semi-structured expert interviews. In the literature review, sustainability issues in last-mile operations among freight logistics companies using a different kind of business models were studied. The semi-structured expert interviews were chosen as the data collection method because the purpose of the research was to find out the companies' point of view on the desired issues.

Interviews were conducted with companies representing three business model categories: crowdshipping companies (CS), last-mile providers (LM), and traditional logistics service providers (LSP). Four CS and three LM companies were known to operate in Finland, and four CS and four LM companies in Sweden in the autumn of 2021. Some of the companies operated in both countries. When the overlaps were removed, six CS companies and five LM companies remained. All of them were asked to participate in the study. The request was also sent to Swedish companies because the number of CS and LM companies operating in Finland was small and the Swedish market is quite similar to Finland. Among the LSPs, five of Finland's largest package delivery companies were requested to participate in terms of turnover. The amount was chosen on the basis that five companies were comparable to the number of CS and LM companies included in the study. A total of 69 percent of the respondents agreed to the interview, divided into CS companies ( $n = 3$ ), LM providers ( $n = 4$ ), and LSPs ( $n = 4$ ), with 91 percent of them from Finland. The market leader of each category was involved. Interviews were conducted in September and October 2021. The companies involved are players of very different sizes. Large enterprises accounted for 45 percent, medium-sized enterprises for 18 percent, small enterprises for 9 percent, and micro enterprises for 27 percent. The titles of the interviewees were mainly chief executive officer, chief operating officer, chief commercial officer, and development director.

The semi-structured interview is a qualitative research approach where the interviewer has a predetermined list of themes and some possible key questions related to these themes, but which allows new ideas to be brought up during the interview. The way the interviewer uses this predetermined list of themes during the interview will depend on interviewer's philosophical assumptions [63]. According to Kvale [64], the semi-structured interview presents open-ended questions whose order of presentation and verbal wording are not strictly defined. It allows the interviewee free narration and additional questions from the researcher. In addition to the background questions, all interviewees were asked questions related to profitability, ecological sustainability, and social sustainability. The interview questions can be found in Supplementary Materials. The total length of the interview material is 381 min, with an average duration of 34.6 min per interview. The interviews were transcribed verbatim, the answers of each interviewee coded, and a database table was built to analyze the data. Based on the transcribed material, remarks were recorded in

the table, which were classified in the first stage according to the themes and questions of the interview. In the second step, the observations were categorized. The categories were used to search for answers to the research questions.

## 4. Results

### 4.1. Economic Sustainability

#### 4.1.1. Crowdshipping Companies

In terms of business profitability, at the time of the interview, all CS companies were loss making. Respondents pointed out that the explanation for financial unprofitability is investing in growth. The CS companies included in the study were either in the startup or growth phase of their life cycle at the time of the interview.

It is related to this growth in the market areas. When going to new cities or a new area, it requires an investment that needs to be funded. It cannot be put in the price of a product or service, so it must be financed as an investment. (CS2)

I would say that our profitability is in our own hands, so to speak. It would be possible for us to do this business profitably now if we wanted to, but it doesn't make sense. Then we would give up growth opportunities that would allow the company to multiply its business and that would not make much sense. There is no reason to do so. (CS1)

Respondents emphasized that overall profitability is not the goal currently being pursued. In terms of profitability, the respondents distinguished between operational profitability and overall profitability. Operational profitability does not include investments that enable growth. A representative of a company operating in several countries pointed out that profitability varies from country to country.

In Finland, operational profitability is relatively good. The longer we have been in a market, the more time we have had to make that business profitable. We have started in Finland, so of course Finland ranks well among them. (CS1)

All three CS companies believed that the business would be profitable in the future. Two of the companies believe that operations will be profitable next year. The third company emphasized that growth would continue to be more important than profitability in the near future. Regarding profitability, the interviewee emphasized the company's own choice.

I believe that by 2030, we have made the choice to be profitable. (CS1)

Each interviewee considered a sufficiently large volume to be the most important factor in profitability. Another profitability factor that emerged was unit economics. Unit economy refers to the income and variable costs associated with an individual unit.

It is especially important in our business that an individual order must be profitable. Then we talk about the unit economy. In our company, the unit economy works well, which means financial profitability. (CS1)

All respondents believed in strong revenue growth. It is expected to come both from the growth of the entire last-mile business due to the growth of e-commerce and from the growth of our own market share. One respondent also raised the idea that the transport market would be moving more broadly toward crowdshipping activities.

We see that crowdshipping transportation services will revolutionize the entire transportation world. (CS3)

CS companies aim to increase volumes in three ways: first, through regional expansion, second, by focusing on customer experience, and third, through factors related to the business model. Regional expansion is being sought both domestically and internationally.

Our business model guides us to operate primarily in major cities. The easiest way to expand into the international market is to do it in collaboration with our

existing international customers. The Nordic countries are the natural alternative next. (CS2)

In connection with the customer experience, marketing, exceeding customer expectations, speed, flexibility, security, and environmental sustainability were mentioned. Factors related to the business model highlighted the expansion from restaurant food to groceries and other products.

The aim is to increase the number of customers by expanding it into new product verticals, such as from restaurants to the grocery store or food markets. (CS1)

#### 4.1.2. Last-Mile Providers

All four LM providers focused on revenue and volume growth rather than profitability. Three out of four reported a loss-making operation and one somewhat profitable. LM companies also distinguished between total profitability and operational profitability. One respondent anticipates that the business will become profitable within two years. Others talked about improving profitability but did not comment on the schedule.

In terms of improving profitability, LM providers highlighted growth in volume and revenue. All four respondents believed in strong sales growth. Another factor affecting the profitability of LM companies was the efficiency of the last-mile process. These included route optimization, successful deliveries (that the product could be delivered to the customer during the delivery timeframe), and minimization of downtime for individual deliveries.

To increase net sales, the domestic and international regional expansion was in line with the CS companies. One of the interviewees saw specialization based on delivery distance to increase revenue.

After all, the strategy of platform companies is to operate at distances of 0–2 km and it is very efficient and competitive. We do not want to compete in that. Then from 50 km up there are nationwide traditional transport companies. When we go 2–50 km in big cities, and that's the market we're hitting. (LM1)

Combining different services with transport services was also seen as an opportunity to increase turnover. Such services included laundry, clothes recycling, and city storage services. Other mentioned ways to increase turnover were price competition and increasing the number of partner customers.

#### 4.1.3. Logistics Service Providers

Regarding traditional LSPs, it should be noted that profitability has not been broken down separately for the last mile and other operations, but the answers are about the company's total profitability for Finland. All four LSP respondents said the operation was profitable.

Based on public data, profitability can be considered to be at a good level and, of course, is expected to develop positively over the next three years and also by 2030. (LSP1)

Profitability is now, let's say, at a reasonable level. The aim is to keep it in the future and thus ensure investment capacity. (LSP2)

Only one respondent said that growth is currently a higher priority than profitability, but at the same time emphasized the importance of operational profitability.

Excluding investments and non-recurring items, profitability is growing strongly and will continue to grow. (LSP4)

The LSP respondents also emphasized the importance of sufficiently large volumes for the profitability of the business, via regional expansion, customer experience, and acquisitions. The importance of process efficiency, such as route optimization, possible use of city hubs, successful deliveries, terminal automation, and high fleet utilization, was



highlighted as another factor. The service network and digital features were profitability factors that only emerged in LSP's comments.

If we look at it for the last mile, then flexible distribution solutions that are controlled by digital capabilities and consolidate large material flows to be distributed over dense areas, achieving virtually this optimal distribution efficiency. (LSP1)

#### 4.1.4. Comparison of Economic Sustainability

Based on the results, profitability varies greatly depending on the business model. LSPs were profitable, whereas CS and LM companies were largely unprofitable, with a focus on growth rather than profitability. Growth is financed by investments. For this reason, the CS and LM groups see a more sensible focus on operating profitability instead of overall profitability (Table 1).

**Table 1.** Profitability and profitability factors of business models.

	<b>Crowdshipping Companies</b>	<b>Last-Mile Providers</b>	<b>Logistics Service Providers</b>
Total profitability	0% of companies were profitable	25% of companies were profitable	100% of companies were profitable
Operational profitability	100% of companies were profitable	100% of companies were profitable	100% of companies were profitable
Emphasized profitability factors	Volume Unit economics	Volume Delivery process	Volume Delivery process Service network Digitalization
Volume growth factors	Regional expansion Customer experience Expanding the business model	Regional expansion Specialization Combining different services	Regional expansion Customer experience Acquisitions

CS and LM companies anticipate the development of profitability in much the same way. Most believe that operations will become profitable very quickly. The exception is the CS company, which is aiming for very strong growth and is ready to withstand unprofitable operations for longer.

Common to the profitability factors was that the importance of sufficiently large volumes was emphasized in all business models, which was why increasing competition was seen as a threat to profitability. If there are many players and competition is fierce, it will be challenging for an individual player to achieve large volumes in its own operations, even if the overall market grows.

The difference in business models meant that whereas LM and LSP groups emphasized the importance of the delivery process, CS players emphasized unit economy. The difference in emphasis between unit economy and process is natural, as the delivery process of LM and LSP companies is in their own hands, whereas CS companies have outsourced it to independent couriers. LSP was the only group to highlight the importance of service network and digital capabilities. It is interesting to note that digitalization emerged in the LSP group, although the entire business idea of CS companies is built on digitalization. The likely explanation is that LSPs will see that they need to be better able to leverage digitalization in their operations to secure their competitiveness.

## 4.2. Environmental Sustainability

### 4.2.1. Crowdshipping Companies

No CS companies had set carbon-neutral targets. However, ecological sustainability issues were generally considered important by everyone. Two interviewees emphasized



that the company's operations are in such an early stage, which is why many things are still in the development stage.

The carbon neutrality target has not yet been defined. That's an important thing, and it's believed that we have the capability to do that, but we're still in the early stages of being carbon neutral in our year or through our company. (CS2)

There are many things in progress and in the process of recruiting people to take charge of things. Surely in a couple of years, we will already be in a much better situation than what is now. (CS1)

Two interviewees highlighted their business model as a key factor in environmental sustainability. It seeks to combine the delivery of goods with existing mobility.

Our operating model is that our transport is handled whenever we move anyway. We have a study of the Natural resource institute Finland which compares delivery from Tampere to Helsinki in our way or in the way of a traditional transport company. As a result, the carbon footprint generated by our business model was 78 percent smaller than in the traditional way. (CS3)

Deliveries are made as lightly as possible, one good example here has been that we used to have one mother who carried last-mile packages everyday while walking with the pram. (CS2)

Emission compensation and ecological packaging were highlighted as factors in environmental sustainability. It was pointed out that sometimes packaging can be omitted altogether and thus reduce the environmental impact.

Carbon emissions related to the transport of all orders have been offset. The next step is ecological packaging. (CS1)

We strive to guide customers so that shipments do not have to be packaged in any way. Because one shipment takes one person to their destination and it is lifted even to the trunk or back seat of the car, they go without packing. (CS3)

The importance of vehicles as an environmental sustainability factor was also highlighted. Interviewees pointed out that because couriers are self-employed, a crowdshipping company cannot directly influence which vehicles they use for delivery. However, the interviewees emphasized co-operation with couriers so that all the possible deliveries, which can be operated with light vehicles are fulfilled with those.

I know that we have such drivers who have electric cars, so they are driving very ecologically. But we cannot affect everything, we have together 3000 drivers and each one of them are moving in their own means. (CS3)

#### 4.2.2. Last-Mile Providers

For LM providers, three out of four interviewees said they had set a carbon neutrality target. One company had a target set for 2022 and another for the end of 2025.

The most explicit goal is to be 100 percent fossil-free by the end of 2022. Partnership is especially emphasized here. Of course, the consumer is communicated about the last mile and its carbon neutrality, but more detailed reports and reports are made with partners, not just about last mile, but the entire supply chain. For example, carbon footprints are calculated for online stores together, but I can't say the exact metrics. (LM2)

The interviewee of one company did not present the actual target year but said that their goal is to have as new distribution equipment as possible using hybrid cars, and especially in the Helsinki metropolitan area, electric distribution vehicles. One interviewee said that their activities are practically carbon neutral, as distribution activities are carried out on cargo bikes and therefore no such target has been set.

We are using bikes, that's the short answer. That was how it started, and we stick to that. We use few cars for internal transport like transporting our own vehicles between cities and workshop and such things, but otherwise it's using bikes. (LM4)

Concrete measures to promote ecological sustainability with LM companies related to the choice of transport equipment, electric distribution vehicles, alternative fuels, route optimization, mileage minimization, the buying of clean electricity, and the use of packaging materials.

In Finland, all transport uses biodiesel, biogas, or electricity for both home deliveries in last mile transport as well all deliveries to vans. We are also constantly testing with our partners on minimum amount of packaging material that we can get it intact to customer. (LM2)

When asking about how the interviewees see their ecological sustainability changing in future, one interviewee believed that by the year 2030 all their deliveries in the biggest cities will be delivered by electric cars. The interviewee also mentioned that in three years electric and biogas vehicles will be used more and that biodiesel has become a standard option.

Well, let's say that within the next three years, electric and biogas cars have already come into use to a greater extent. (LM1)

Other interviewee stated that in future the situation will be much better and as their company's market share and volume will grow, the environmental effect per package will decrease.

Our profitability and environmental responsibility will go hand in hand, when the volume increases, we will be able to deliver even more efficiently . . . that our algorithm will be able to make even better decisions about what types of routes should be taken. That's going to change for the better. (LM2)

#### 4.2.3. Logistics Service Providers

All four LSPs interviewed saw ecological sustainability as an important issue, and they had all set carbon neutrality targets. The goal of the three companies was to be completely carbon neutral by 2030. For the fourth interviewee, the target was separated into two separate sections, first aiming for emission reductions by 2030, and then aiming for carbon neutrality by 2040. Other interviewees also mentioned various milestones. The milestones were related to, for example, the electrification of transport equipment or regional carbon neutrality targets.

Based on the interviews with LSP companies, concrete measures to promote ecological sustainability can be divided into categories: ecological vehicles, business model, energy efficiency, and emission compensation. The category of ecological vehicles included electrification of vehicles, alternative fuels such as biogas and biodiesel, and cargo bikes.

There are already more than 20 electric cars in the distribution of the packages and the next electric car orders are about to go. We will more than double the number of electric cars during 2022. (LSP1)

In improving energy efficiency, measures will focus on route optimization, environmentally friendly terminals, improving capacity utilization, and reducing e-commerce returns. All interviewees highlighted the optimization of transport routes. Reasonable fleet management related to the optimization of transport routes was also mentioned.

We have environmentally friendly terminals in use. Route optimization is enabled to reduce extra kilometers. We have a variety of projects with our largest e-commerce customers to reduce returns associated with e-commerce platforms, or to return returns to the used market. (LSP4)

Emission compensation was also raised by one interviewee, but it was pointed out that compensation is not actually counted as a reduction in emissions or as a measure, but as an additional means of environmental responsibility. The interviewee of the same company also mentioned that they are involved in the “Well below 1.5 degrees” program and in the environmental grouping set up by customers, which aims at different levels of environmental performance together.

When asked about the change in environmental sustainability, it was felt that the change is constantly taking place and that operations are becoming more and more responsible.

We are acting more responsibly and responsibly all the time. (LSP1)

Planning has already been done and implementation is already underway. In other words, we measure our emissions within the Group more accurately each quarter. Every country is reported and the fact that we are keeping pace with change. Our change is planned for 2030 with its dates and targets. (LSP4)

#### 4.2.4. Comparison of Environmental Sustainability

Based on the interviews, the environmental sustainability issues were considered important by all companies. Still, there is a clear difference among different business models related to carbon neutrality targets. All LSPs interviewed, and two out of four last LM providers, have set carbon neutrality targets, whereas none of the CS companies had. This is mainly due to the nature of business models and the fact that CS companies are quite new in the markets. However, one interviewed CS company had carried out carbon footprint study and another had compensated all emissions from the deliveries throughout its history.

The biggest difference related to environmental sustainability between the business models was that two CS companies emphasized the ecological nature of their business model. By this, the respondent meant that the company’s deliveries take place in connection with other travel. In the same context, a study was presented showing that the business model had a 78 percent lower carbon footprint than traditional operations. The extent to which deliveries took place in connection with other travel varied considerably from company to company. The whole business idea of one interviewee was based on deliveries as part of the other travel. Another had this approach in addition to separate deliveries, and the third focused on deliveries within an hour, which requires separate deliveries to be successful.

Reduction in transport emissions through low-emission and carbon-neutral distribution vehicles were something all companies mentioned as their environmental sustainability measure. All the companies talked about electric vehicles and LM and LSP companies also talked about alternative fuels. All groups also raised the issue of light electric vehicles. LM and LSP companies highlighted the use of cargo e-bikes, with one LM company saying that all their deliveries are made on different bicycles. For CS, light electric vehicles mean e-scooters and e-bikes. CS companies also highlighted the use of ordinary bicycles and on-foot distribution. Delivery on foot can take place, for example, when pushing baby prams. The CS group stressed that it is a matter of cooperation, as they cannot dictate which vehicles are used by independent couriers.

Improving energy efficiency was also common to all groups. Everyone had the means to do so by optimizing their distribution routes. In addition to this, the LM and the LSP groups mentioned the ecology of the terminals. The LSP group also highlighted capacity utilization and reduced e-commerce returns. The promotion of ecologic packaging was common for CS and LM groups. The CS group also raised the issue of avoiding packaging altogether. Other measures included the use of renewable energy in the LM group and emission compensations (Table 2).

**Table 2.** Carbon neutrality targets and means of environmental sustainability.

	Crowdshipping Companies	Last-Mile Providers	Logistics Service Providers
Carbon neutrality target	0% of companies have set	50% of companies have set (2022, 2025)	100% of companies have set (2030, 2030, 2030, 2040)
Ecological vehicles	Electric vehicles Bicycles E-scooters On foot deliveries	Electric vehicles Alternative fueled vehicles Cargo e-bikes	Electric vehicles Alternative fueled vehicles Cargo e-bikes
Packages	Ecological packaging materials Avoidance of packaging	Ecological packaging materials	
Business model	Deliveries in connection with other travel	Deliveries by bikes and cargo e-bikes only	Reducing e-commerce returns
Emission compensation	Compensation in use	Compensation in use	Compensation in use
Energy efficiency	Route optimization	Route optimization Ecological terminals Use of renewable energy	Route optimization Ecological terminals Capacity utilization

A total of 75 percent of the interviewed CS companies believed that their ecological sustainability will be developed significantly in following three years. LM providers' statements varied remarkably. One believed that all the deliveries in the biggest cities will be carried by electric cars in future, one said that as their market share will grow the environmental effect per package will decrease, and one said that there will be not that big changes in near future. LSPs felt that sustainable development is already strongly going on, so change has already happened and that they are doing a lot of work for being ecological sustainable and reaching the carbon neutrality targets in future.

#### 4.3. Social Sustainability

##### 4.3.1. Crowdshipping Companies

Regarding social sustainability, all representatives of CS companies raised the issue of job creation in society. According to one interviewee, CS work should be included as one of the national employment measures because it enriches the possibilities of doing work, makes work visible, and creates new work.

At its best, it gives people a chance to earn more. Share job opportunities that would not otherwise be known to anyone. (CS3)

We are the companies that have been able to bring in new work. We have 4000 courier partners, 2500 merchant partners. By this year alone, our employment impact in Finland will be over 10,000 people. The estimate is that it will double in a few years. Employment effects include couriers, employment effect of additional sales on restaurants and merchants and then own office workers. Globally, we already have over 100,000 courier partners. (CS1)

Courier work was described as non-threshold work, which is well suited to, among others, those who value freedom, want more income, students, immigrants, and the unemployed. Taxi drivers, conscripts, and pensioners were highlighted among those who wanted extra income.

For people who want a threshold-free job opportunity that doesn't have strict language or training requirements and can decide for themselves when and where to do it. You put your app offline. Some do it full time, some in addition to their studies, someone in addition to another job. It's good, even for people with an immigrant background, if you don't speak Finnish, it doesn't matter. (CS1)

There were also people who could only do short or occasional work breaks for one reason or another.

We also have people who have an injury or disability that prevents them from doing other work. You can do an hour or day gig, there are a lot of people who really want to operate in that type of environment. In other words, it is really enriching society's current job opportunities. (CS2)

One of the companies commented that crowdshipping companies and platform companies in general use algorithm management very differently.

Many companies use algorithmic management, where the courier receives different grades. If you say no to gigs, you will be offered worse gigs or fewer gigs. If you do slower, you will be offered fewer gigs. We do not do anything like that. We do not put couriers in the rankings. (CS1)

CS work involves a hot topic about whether employees are self-employed or employees of a company. All interviewees agreed that clearer legislation was needed. One interviewee pointed out that the criteria of the European Court of Justice would be a good basis for legislation.

The European Court of Justice ruled on the criteria for when a person is an entrepreneur and when he is employed. Their position was that when the four specified criteria are met, it is entrepreneurship. In my opinion, the same criteria could be introduced in Finland for crowdshipping companies as well. The first is that if a person is allowed to decide for themselves when he will work. Secondly, if a person is allowed to say yes or no to every gig offered without any consequences. Third, if a person is free to use a substitute. Fourth, if a person is free to work at the same time for which companies she wants, that is for us or our competitors. Thus, if these four criteria are met, then the person is an entrepreneur. If any of these fails, the person must be hired. I think this is a good and clear criterion. (CS1)

#### 4.3.2. Last-Mile Providers

For LM providers, social sustainability was seen as a competitive factor when competing for labor. Two interviewees raised the current labor shortage, which is thought to be getting worse. In terms of content, LM providers raised issues related to labor law, such as the payment of wages and sick leave.

The shortage of drivers will increase, so the view is that responsible companies that receive a salary in accordance with the collective agreement and act in accordance with the agreements will do well.

(LM1)

We strive to employ as many qualified drivers as possible. There are enough jobs, but not so many employees. For such a growing company in terms of manpower, labor shortage is the biggest challenge now.

(LM3)

#### 4.3.3. Logistics Service Providers

LSPs saw social sustainability in a similar way as LM providers. Minimum wages, occupational health care, working hours, occupational safety, work clothes, etc., were raised.

We have no driver below the minimum wage and not really at the minimum wage. There is occupational health care and everything else guaranteed. Working hours remain within the working time legislation. (LSP4)

Occupational health care, occupational safety, work clothes and everything related to work is provided. The equipment on which the work is done is certainly appropriate and equipped with the latest safety and other technologies. (LSP1)

The interviews also highlighted labor shortages and the role of social sustainability as a competitive factor in competing for labor.

Specifically on the e-commerce and parcel side, social sustainability becomes a competitive factor. Availability of car drivers is getting tighter and tighter all the time. I believe that in the future, skilled personnel will apply to companies that take care of these matters. (LSP1)

All LSPs stated that the use of crowdshipping work will also be possible in their company in the future if the legislation is clarified and the work can be carried out responsibly. Two companies had also previously had pilots using CS company as a subcontractor.

If the legislation is perfectly clear and that everyone interprets it in roughly the same way and it allows the use of the platform economy and such flexible resources to control material flows, then why not in the future. In any case, it is not ruled out, at least from the plans, and, as I said, we are constantly looking at the matter and constantly monitoring the direction in which this entity is going and what is evolving there and in what direction the legislation is moving. (LSP1)

#### 4.3.4. Comparison of Social Sustainability

In terms of social sustainability, the views of the different business models differed widely. LM providers and LSPs focused on responsibilities and arrangements organized by employers, such as minimum wages, occupational health care, working hours, occupational safety, and work clothing. The importance of social sustainability as a competitive factor in labor shortages was also highlighted in both groups. Instead, CS companies emphasized the importance of job creation for people and society (Table 3).

**Table 3.** Emphasis of social sustainability by business models.

	Crowdshipping Companies	Last-Mile and Logistics Service Providers
Emphasis on social sustainability	Job creation Non-threshold work Freedom of work Making work visible Employment activity	Employers' responsibilities Minimum wages Occupational health care Working hours Occupational safety Work clothing
Availability of labor	Workforce available	Shortage of manpower

An interesting detail in the results is that the LM and LSP group emphasized employers' responsibilities as a competitive factor in the competition for labor. At the same time, however, they are suffering from labor shortages. In contrast, CS companies emphasizing freedom of work said not to suffer from labor shortages. The same view was shared by all groups that legislation on crowdshipping work should be clarified. If the legislation is clarified, then all LSPs and one LM company stated that the use of crowdshipping work will also be possible in their company in the future. Two CS respondents saw that crowdshipping deliveries will be inherently linked to the services of traditional transportation companies in the future.

Our operating model complements the service of traditional operators and the way we provide these services. Anyway, I would see that the platform economy does not replace traditional logistics and forms of traditional logistics but complements them. By combining these, the best solutions are obtained. I would think that model is more like this than one superseding the other. (CS2)

## 5. Discussion

The interviews carried out in this study allow us to make a number of conclusions. The first research question sought to determine if the newer last-mile delivery business model's approach to profitability differs from the traditional business model. In this case,

the attention of the respondents of CS and LM companies was not focused on profitability but on business growth. They were also ready to invest in the growth and thus accept the momentary loss of the business. All LSPs were financially profitable. In contrast, none of the CS companies were, and only 25 percent of the LM providers were profitable. One study points out that in order for a crowdshipping company to succeed, it must reach a critical mass of users as quickly as possible to establish itself as a dominant player [65]. One of the CS companies interviewed clearly has this strategy. Instead of total profitability, CS and LM companies focused on operational profitability. Measured by this metric, all were profitable. Studies comparing CS companies to traditionally operating LSPs have shown simulation results that a CS operating model is more efficient than a traditional one [21,30,31,33]. In this study, the companies refused to give accurate details relating to operating profitability, so the results obtained from the simulation studies cannot be confirmed or disputed.

As a factor of profitability, all companies emphasized a sufficiently large volume. In addition to high volume, CS companies emphasized unit economics, whereas LM and LSP companies emphasized the delivery process. Route optimization became an important profitability factor in streamlining the delivery process of LM and LSP companies in both previous studies [23] and in this study. In previous studies, drone delivery [28], delivery to the trunk of the customer's car [7], and autonomous delivery robots [29] emerged as technologically innovative solutions for improving efficiency. In this study, none of the respondents identified these as a relevant factor from the point of view of profitability.

Our second research question sought to understand whether companies with different business models set themselves a goal of carbon neutrality and how ambitious they were. We found that the environmental sustainability was seen as very important among all the interviewed companies. Nevertheless, there were clear differences in setting a carbon neutrality goal. All LSPs and half of the LM providers had set clear carbon neutrality goals, whereas CS companies had not. LM providers clearly had the most ambitious goals. They aimed for carbon neutrality in 2022 and 2025, whereas LSPs' goals were in either 2030 or 2040. In the research of Evangelista et al. [44], transport companies had clear gaps in their awareness of the importance of environmental sustainability. In this study, all companies considered environmental issues very important. The likely reason for the difference in results is the roughly 5-year difference between data collection.

Our third research question examined whether the used business model affected the means to achieve environmental sustainability. The biggest differences were related to the nature of the business models. Some CS companies emphasized that their business model itself was environmentally sustainable, as they mainly supply goods on other journeys. However, it should be noted that there are large differences in the CS business model as to whether the deliveries take place as separate transports or in connection with other journeys. One LM provider emphasized that they only use bicycles and cargo e-bikes in their deliveries, which makes their business model very environmentally friendly. LSPs said that they have been developing environmental sustainability already for many years and are constantly developing it with several measures, for example, reducing e-commerce returns.

The common measures were the increasing adoption and use of green distribution vehicles. Electric vehicles were mentioned by all interviewees. CS companies also used e-scooters, bicycles, and on-foot deliveries. LM providers and LSPs used, in addition to electric vehicles, cargo e-bikes and alternatively-fueled vehicles. Based on other studies, the use of electric vehicles and light goods vehicles has increased significantly in recent years in last-mile logistics and those are identified to be important means to reduce greenhouse gas emissions in delivery operations [40–42].

It is clear that due to increased competition and increased cost pressure, freight transport companies are generally aiming for more energy-efficient delivery operations with several measures [17,34]. In this study, all interviewed companies improved their energy efficiency by optimizing distribution routes. In addition, the importance of maximizing



capacity utilization, building ecological terminals, and the use of renewable energy were mentioned.

Our fourth research question examined how do crowdshipping companies' attitudes and emphasis on social sustainability differ from other transport companies, and how do they affect labor availability. Crowdshipping companies emphasized job creation for people and freedom of work. The results are well in line with previous studies in which job creation [55], freedom of work [27], and the possibility of additional earnings [57] have been highlighted as strengths of crowdshipping work. As part of the freedom of work, the fact that algorithms are not used for harsh management was brought up. Last-mile providers and logistics service providers, in turn, emphasized the responsibilities of employers. Previous studies have also seen social security as a strength of traditional work and a lack of social security as a weakness of platform work. [57,58].

Labor shortages emerged in the LM and LSP groups and good labor supply was emphasized in the CS group. Good labor availability was especially emphasized by the CS company, which stressed that it does not use algorithmic management to rank couriers. Kusk and Bossen's study of Wolt couriers showed that couriers did not find algorithmic management a problem when it was used leniently [53]. It would appear that the demand and supply of work in crowdshipping are met better than in traditional work, especially when algorithmic management is not used harshly.

## 6. Conclusions

The purpose of this study was to compare the differences in the attitudes and emphases of last-mile delivery companies operating with different business models to sustainability in Finland. A literature review was carried out and eleven semi-structured expert interviews were conducted in companies representing three business model categories: crowdshipping companies, last-mile providers, and traditional logistics service providers. We found that the crowdshipping and last-mile companies were largely loss making, whereas logistics service providers were profitable. The first two groups invest heavily in growth, which explains the loss. All logistics service providers and half of the last-mile providers have set a carbon neutrality target, whereas none of the crowdshipping companies have. From a social sustainability point of view, crowdshipping companies emphasized job creation in society and freedom of work. Instead, the last-mile and traditional logistics companies emphasized the responsibilities of the employer.

For the scientific community, this study provides new insights into the subject from the perspective of companies and business models, as research directly related to sustainability in logistics companies in the last-mile, and in particular, their views and approach to sustainability, is rare. Furthermore, there is little research covering all three aspects of sustainability by comparing logistics business models. This study began to fill these research gaps. For management and administration, research provides insights into the views of companies that can be utilized in future decision making. For example, if the legislation of crowdshipping becomes clearer, then traditional companies could consider using it in their own operations to overcome labor shortages. Traditional companies can take advantage of crowdshipping either by developing their own platforms or by collaborating with crowdshipping companies. The availability of labor would seem to be especially good when the platform's algorithm management is used in a gentle way. Seven of the eleven interviewed companies operate internationally. Based on this and the similar development of last-mile delivery companies around the world, the results can be transferred especially to other EU countries because the legislative framework and operating environment are sufficiently congruent.

The limitation of the study is that the CS and LM companies included in the study were startup and growth-stage companies, whereas the LSPs were in a mature stage of their life cycle. When comparing business models, the optimal situation would be one in which all companies would be at the same stage of their life cycle. However, this was not

possible, as both CS and LM companies are rather new business models in Finland that have become more common with the growth of e-commerce.

Further research should be focused especially on crowdshipping. Regarding economic sustainability, further research could be conducted on how the profitability of crowdshipping companies develops when the companies move from the startup and growth phase to the mature phase. Regarding social sustainability, it would be useful to examine whether couriers themselves want to be entrepreneurs or employees and what factors influence their willingness to be entrepreneurs. Courier job satisfaction and the factors affecting it would also be a useful subject for further research. Regarding environmental sustainability, it is interesting how quickly companies can switch to electric vehicles and meet the carbon neutrality goals they have set for themselves. It is also worth doing further research on what kind of future scenarios there are for the situation and sustainability of crowdshipping transport services.

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