Creating Shared Value from Collaborative Logistics Systems: The Cases of ES3 and Flexe

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Abstract. Shared value enhances the competitiveness of a company while simultaneously reducing societal burdens. By allowing companies to share their resources, collaborative logistics systems provide companies with an opportunity to create shared value, namely, not only economic value by enhancing the utilization of resources, but also social value by reducing energy consumptions and greenhouse gas emission associated with logistics and transportation. Emerging businesses, such as ES3 and Flexe, have recently demonstrated how they create shared value through collaborative logistics services, for example, ES3's collaborative warehousing and direct-to-store (D2S) program, and Flexe's on-demand warehousing platform. However, the development of collaborative logistics systems is currently at a nascent stage. There are quite a few socio-technical barriers to overcome for sharing resources (data as well as infrastructure). This research examines how companies create both economic and social value from collaborative logistics systems. We highlight socio-technical barriers, particularly one set of social barriers, that is, competition-oriented conservatism prevalent among companies. Using the case study methodology and interview data, we closely investigate ES3 and Flexe, which provide collaborative logistics services, and demonstrate how technological and social barriers are addressed to create shared value from collaborative logistics systems.

Keywords: Shared Value, Economic and Social Value, Socio-Technical Barriers, Collaborative Logistics, Data and Infrastructure Sharing

1 Introduction

Shared value enhances the competitiveness of a company while simultaneously reducing societal burdens [1]. Creating shared value thus advances economic and social conditions in the communities in which a company operates. The recent development of interconnected—collaborative—logistics systems[1] provides companies with an opportunity to create shared value through collaboration.

[1] The interconnection of logistics systems is also termed as the Physical Internet by Montreuil [2]. The Physical Internet is a new concept, which can be defined and named differently across various fields and disciplines.

Collaborative logistics systems make transportation and logistics more efficient and sustainable by enabling sharing both data and infrastructure that are interoperable and standardized. By allowing companies to share their resources, collaborative logistics systems not only enhance the utilization of resources, but also reduce energy consumptions and greenhouse gas emission associated with logistics, production, and transportation [2].

The sharing of resources is not new in today's sharing economy. Ride-sharing companies, such as Uber and Lyft, and room-sharing companies, such as Airbnb, employed a new business model that uses online platforms to allow shared access to unused goods and services [3]. However, unlike sharing resources among individual consumers as realized in the ride-sharing and room-sharing businesses, collaborative logistics systems facilitate resource sharing among separate businesses, thereby creating shared value. Emerging businesses, such as ES3 and Flexe, have recently demonstrated how they create shared value through collaborative logistics services. For example, ES3's collaborative warehousing and direct-to-store (D2S) program brought manufacturers and retailers together to share resources and eliminate waste by streamlining supply chains. Flexe's on-demand warehousing platform creates a marketplace by connecting supply and demand and matches excess warehousing capacity with seasonal inventory overflows among warehouse operators and third-party logistics (3PL) providers. However, the development of collaborative logistics systems is currently at a nascent stage. There are quite a few socio-technical (both social and technical) barriers for collaboration and sharing resources (data as well as infrastructure), which should be overcome by collaborative logistics service providers such as ES3 and Flexe.

In general, companies put their survival and competitiveness ahead of collaboration. Competition is a deep-rooted barrier for collaborative logistics systems. Conservatism is prevalent in industries and discourages building and using collaborative systems for shared value. Without changing the way companies behave, the potentials of collaborative logistics systems will not be fully realized. In this research, we examine how collaborative logistics systems create shared value. We highlight socio-technical barriers, particularly one set of social barriers, that is, competition-oriented conservatism prevalent among companies, which should be overcome to create shared value with collaborative logistics systems. Once addressed, barriers often become drivers [4]. Drawing on the concepts of the sharing economy and shared value, this research identifies the ways to facilitate collaboration among companies to create shared value (both economic and social value) with collaborative logistics systems. We consider competition and collaboration on a continuum where both can coexist. What is required for creating shared value is to change the mindset of companies more toward collaboration by reducing competition-oriented conservatism.

2 The Sharing Economy and Shared Value

The sharing (or collaborative) economy refers to a socio-economic system that enables shared access to goods, services, and resources, including data, infrastructure, and talent [5]. As seen in the examples of Zipcar and more recently Uber and Airbnb, the shared economy improves efficiency and effectiveness by enhancing the utilization of goods, services, and resources through sharing (or collaboration) while capitalizing on current and emerging technologies.

According to Sundararajan [6], the sharing economy is characterized in general as largely market-based, high-impact capital (utilization of resources to their full capacity), crowd-based networks (capital and labor supplied by crowds of individuals), and blurring lines between personal and professional as well as fully-employed and casual labor. These characteristics of the sharing economy are well illustrated in the cases of ride-sharing companies, such as Uber and Lyft. However, there are emerging sharing economy companies. Unlike sharing resources among individual consumers, these companies make possible resource sharing among separate businesses, thereby creating shared value.

Shared value refers to not only economic, but also social value [1]. Social value can be created with policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates [1]. The concept of value here reflects benefits relative to costs, not just benefits alone. Shared value considers societal harms that can create internal costs for companies, such as wasted energy and pollution. According to Porter and Kramer [1], addressing societal harms does not necessarily raise costs for companies, but rather increase their productivity and market share by developing new ways of doing business through using new technologies, operating methods, and management approaches.

ES3 provides shared infrastructure, such as collaborative warehouse and trucking to both manufacturers and retailers. Manufacturers benefit as they avoid owning or investing in fixed assets that are not always at maximum capacity. Trucking facility builds and ships fuller trucks with products from various manufacturers, reducing the number of shipments and wasted space in containers. ES3's D2S program removes a leg of transportation, as product travels directly to the store, making going green not only better, but faster. Shared infrastructure also helps retailers achieve just-in-time (JIT) by lowering the economic order quantity (EOQ). JIT also helps retailers shorten lead times and lower inventory levels. Overall handling, inventory, and transportation costs are dramatically reduced as the supply chain becomes more streamlined and efficient. The technologies and operational model of ES3 create shared value, not only reducing societal harms by reducing energy consumption, wastes, and pollution—fewer trucks placed on the road with fuller containers, but also creating economic value—flexibility and optimum utilization of resources—to both manufacturers and retailers.

Unlike ES3, Flexe does not have any physical warehouse infrastructure. It is a technology company that builds a marketplace (or platform) to connect demand and supply for sharing each other's warehousing capacity. Since warehouse operators incur cost on space whether it is occupied or not, Flexe creates value for the supplier's end by providing means to convert an otherwise empty space into a revenue-generating stream by connecting them with customers. On the demand end, value is created by allowing access to a larger footprint with flexible durations. Thus, Flexe provides access to spaces available in an on-demand format without the rigid commitments of having to sign a long-term lease or investing high capital in building a facility.

3 Social Barriers to Collaborative Logistics Systems

Digital connectivity has enabled the sharing of data and infrastructure, thereby changing the way logistics is done. A neutral platform (digital or physical) can be developed for companies to collaborate and share resources. However, in order to capture the full potentials of collaborative logistics systems, emerging businesses, such as ES3 and Flexe, should address potential barriers, both technological and social. Technological barriers can be lowered through the adoption and use of platforms and infrastructure that are interoperable and standardized. Challenges are to build a network of interconnected warehousing capacity in a truly automated and seamless format without human intervention. Compared to technological barriers, however, social (or non-technological) barriers are much harder to address since social changes are relatively slower than technological changes [7].

There are several potential social barriers: 1) recognition of the value of collaboration among companies, 2) trust building, 3) lack of incentives for companies to participate in collaborative logistics systems. Companies typically compete against each other and are likely not to collaborate when the relationship is occasional or bound in short-term contracts. However, as businesses recognize that collaborative logistics systems reduce social harms, not just create economic value, more companies would participate in the systems, and as a result, costs would be further lowered, and the systems would sustain better. As Porter and Kramer [1] state, creating shared value (both economic and social value) will be the key to unlocking new business innovations as well as societal and economic progress. Trust is hard to build and will be the biggest hurdle for collaborative logistics systems since contractual obligations should be abode by involved parties, but they often bring up haggling and disputes [8]. Another barrier is the lack of incentives for companies to participate in collaborative logistics systems. Companies put competitiveness ahead of collaboration and often take positions that can achieve a competitive advantage. Thus, unless real evidence for cost reduction (not only economic costs but also societal costs, e.g., environmental costs) and value creation (not only economic value but also social value) is provided

by collaborative logistics systems, companies will not participate in the systems, and their full potentials will not be realized.

4 Case Studies

4.1 ES3

ES3 was founded in 1999 to save time and reduce costs in the consumer packaged goods (CPG) supply chain. Since its founding, ES3 has focused on eliminating waste and sharing resources by providing shared infrastructures, such as collaborative warehouse and trucking to both manufacturers and retailers. Es3's first collaborative warehouse was opened in 2002 in York, PA and housed 140,000 pallets, and the company expanded by opening other facilities in Dallas in 2003 and Atlanta in 2004. Today, ES3's flagship collaborative warehouse facility in York, PA supports storage of 400,000 pallets, shipping of more than 300 million cases annually, and management of more than 20,000 items.

ES3's flagship York facility, so-called "Really Big Consolidated Warehouse (RBCW)," is a 5 million square foot facility; it combines multiple manufacturers' supply chains into a single, very large supply chain by consolidating the manufacturers' mixing centers (MCs) in the same facility as the retailers' distribution centers (DCs). Owning facilities typically lead to an inefficient use of storage space, wasting money, as shown in Figure 1. For most of the year, a facility is operating either under or over capacity due to fluctuation in demand. ES3's collaborative warehouse adopts an outsourced model, where payment is made only for space actually used. This eliminates wasted storage space during offseason and saves spending on outside storage during peak season, which typically carries a high cost. In other words, ES3's collaborative warehouse allows manufacturers and retailers to be more flexible and better utilize their money [9].

Coupled with RBCW, ES3 rolled out the direct-to-store (D2S) program in 2010, which was created to streamline the supply chain further by eliminating a distribution center and leg of transportation. D2S made delivery not just faster, but greener, as product travels directly to the store. ES3's D2S program puts the manufacturers' mixing centers and the retailers' distribution centers together under the same roof. Products flow from the factory to the collaborative warehouse and then directly to the store, in 24 hours or less [10].

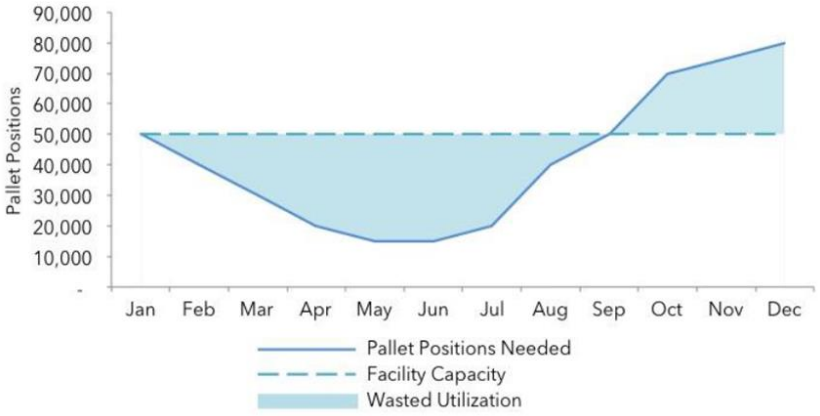

Fig. 1. Wasted Utilization of Owned Warehouse Facility (Source: [9])

Traditionally, a large manufacturer created mixing centers where product from all of its manufacturing facilities was shipped.[2] The retailer could order a truckload of product, across all of the manufacturer's product lines. The truckload of mixed products was then shipped to the retailer's distribution center (DC) for selection into store orders and distribution out to the stores with product from other manufacturers. The creation of MCs helped to reduce the economic order quantity (EOQ) to a truckload of all items sold by the manufacturer from a full truckload shipped from a single manufacturing plant. This improved the efficiency of getting fast-movers to the shelves. However, the EOQ of a truckload is still not economical enough for a slow-mover (an item ordered in a pallet or less). If a slow-mover is out of stock, the retailer has to wait until there is sufficient demand for the fast-movers to allow the creation of a full truckload order. In this case, the EOQ is not in line with the demand quantity, resulting in inefficiencies in the supply chain and lost sales.

ES3's RBCW aimed at providing the infrastructure to cost effectively change the EOQ for CPG industry. By combining multiple manufacturers' mixing centers, it allows the reduction of the EOQ from a truckload to a case. Unlike a typical warehouse that serves a manufacturer exclusively, ES3 serves multiple manufacturers (and retailers) and can optimize warehousing and transportation. It is an end-to-end supply chain solution that is faster, cheaper, and greener than existing supply chain models, which makes the benefits of the delivery of just-in-time inventory truly realized—selling a case shipping a case [10]. This scale changes the delivery time from 5 days to 24 hours or less on average. These changes in the supply chain enable to replace product on the shelf just-in-time and avoid out-of-stocks in a more efficient and cost-effective way than the individual manufacturer and retailer supply chains. In other words, inventory handling and transportation costs are dramatically reduced as the supply chain becomes more streamlined and efficient. Figure 2 shows the traditional

[2] A mixing center can be outsourced, but it typically serves one manufacturer exclusively.

supply chain and ES3's consolidated supply chain based on collaborative warehouse and direct-to-store program.

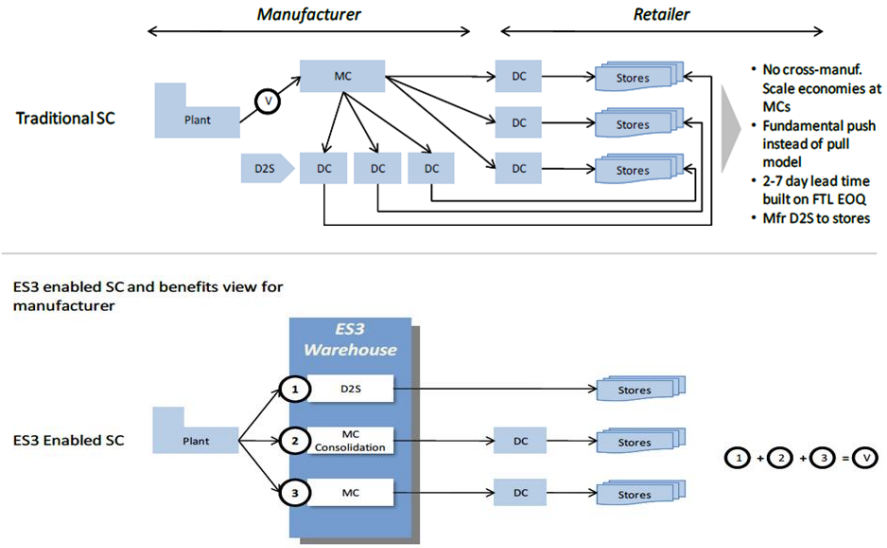

Fig. 2. Traditional Supply Chain and ES3's Consolidated Supply Chain (Source: [10])

ES3's consolidated model, the collaborative warehouse coupled with the D2S program, delivers value to consumers, retailers, and manufacturers by getting the product to shelves faster, also lessening the amount of carbon emissions. Due to quick replenishment cycle, retailers could store inventory for less time, reducing stock to its most efficient and optimal level. Less inventory means less waste, such as unsaleables, wasted touches, time and money. By removing a leg of transportation and increasing truckload utilization through the consolidation of multiple manufacturers' products, both transportation costs and carbon emissions are reduced; retailers can place smaller and more frequent orders without increasing transportation costs and leaving valuable space empty on hauls. ES3 builds and ships fuller trucks, reducing the number of annual shipments, as trucks do not ship with any wasted space. Emissions are significantly reduced with every truck taken off the road. For example, for every 500 miles haul, a truck eliminated from being on the road reduces a carbon footprint of 846 kg over a year.

Sharing infrastructure, such as warehouses and trucks, reduces environmental impact. One full truck can transport multiple manufacturers' products, rather than each manufacturer sending a partial truck. As product variety increases, replenishment orders would continue to be smaller and more frequent. Therefore, it will become increasingly important for manufacturers to be able to deliver small quantities quick-

ly. ES3's collaborative model is designed to meet with decreased minimum order sizes and to increase delivery speed, without increasing cost.

4.1.1. Socio-Technical Barriers: Findings from Interviews

There are barriers, however, both technological and social, that should be addressed for the collaborative model to achieve full benefits. A major technological challenge is to build infrastructure for collaboration through sharing resources. One is to build a neutral platform whether it is physical, digital, or both, which interconnects manufacturers as well as retailers, allowing them to interoperate as partners in a truly automated and seamless format. It is a challenging requirement for a collection of manufacturers and retailers since they not just compete, but also see each other as the enemy in a zero-sum game as they negotiate trade dollars. No partner has a home team advantage on a neutral platform where they collaborate. ES3 provides the platform, the collaborative warehouse enabling the D2S program, which treats all parties fairly. It serves as the clearinghouse for information on cost and inventory that each partner views as confidential and ensures that each partner sees only the information necessary for their transactions [10]. A former chief marketing and strategy officer of ES3 states:

"We sign confidentiality agreements with each of the participants. We have strict guidelines about what we can share and what we cannot share."

ES3's collaborative warehouse is fully automated, supporting pallets where the cases can be sequenced to match the category layout of each retailer store. This improvement in pallet design, along with greater shipping accuracy and enhanced paper and electronic documentation, reduces the labor required to move the product from the back room of the store to the shelf.

Apart from the technological barriers, there are social barriers. A major social barrier is a competition that leads to a lack of trust and shared vision. Collaboration is unheard of among companies with competing product lines. A former chief marketing and strategy officer of ES3 states:

"The challenge is getting more people to understand that sharing is going to be the way forward. This concept of sharing infrastructure is hard for existing supply chain professionals to grasp."

Therefore, for collaboration, they need a neutral platform where they feel comfortable working together, thereby reducing the supply chain (or logistics) costs. Then, the activity can be more focused on holding the product price and managing the increasing cost of goods. The development of a business model is also a challenging requirement, which motivates partners to collaborate and participate in collaborative logistics systems. If they recognize the economic and social value created from the sharing of resources and collaboration through collaborative warehouse coupled with

the D2S program, they will participate in it. A former chief marketing and strategy officer of ES3 states:

"What we did was look at, essentially the cost of the supply chain to the participants before collaboration and after collaboration and so there's the economic portion wherein after collaboration you collapse the number of warehouses, reduce the number of warehouses and amount of transportation that there are financial savings that can be passed onto each of the participants."

She continues:

"Everybody said 'show me the value passed onto me through collaboration'' before they would say 'yes' to doing it. So we said 'okay we will make the savings contractual.' We built the savings into the rate we charged manufacturers so they are guaranteed to see the benefits of collaboration."

The business model ES3 developed is so-called "shopping mall model," based on which the more space they use, the lower rate they pay. She states:

"ES3's business model is based on volume made. So the bigger you are, the less you pay."

4.2 Flexe

Flexe was founded in August 2013. It is a cloud-based marketplace that connects warehouse operators and third-party logistics (3PL) providers. Flexe provides on-demand warehousing services from pallet overflow storage, to fulfillment operations, by creating a peer-to-peer marketplace that connects demand and supply for sharing each other's warehousing capacity [8].

Over the past five years since it was founded, FLEXE has built a network of more than 750 warehouses across the US and Canada by providing solutions for companies that need additional warehousing space (excess inventory) and companies that have excess capacity. It had more than a three-fold growth for the past two years (a network of 200 warehouses in 2016 to a network of 750 warehouses in 2018). Flexe's on-demand warehousing services create huge economic and social value by creating a platform of the marketplace where warehousing companies can buy and sell warehouse space (sharing warehouse space) when needed. By storing other organizations' inventories as well as their own, companies could improve the utilization of warehouse capacity, thereby saving energy consumed, e.g., electricity, and monetize what would otherwise result in wasted space.

A typical problem warehouse companies and 3PL providers face with is the fluctuation of the utilization levels of warehousing capacity. There are periods of time when a company's warehouse capacity is idle. Likewise there are companies in need of

additional capacity but do not want to extend the current lease terms or to make long-term contractual commitments. It is also challenging for companies to find each other to deal with excess warehousing capacity and inventory overflows for the secure and efficient handling of goods between them. Flexe solves this problem by allowing companies with the excess capacity to rent it to companies looking for additional capacity on a cloud-computing platform. This platform also matches shippers and warehousing providers and enables scheduling inbound and outbound shipments, tracking inventory, managing billing, and legal agreements. By getting on-demand services, companies do not need additional capital investment (e.g., building more warehouses) or long-term space leases to prevent interruptions in their inventory management processes.

On-demand warehousing is "a spot market companion to the existing 'long market' built on warehouse leases and/or property ownership" [11]. It addresses the problem that warehouse capacity is typically fixed while inventory levels vary. Warehousing companies typically accept empty space incurred during the year as sunk costs and simply regard it as a cost of doing business. The use of subleasing is not common due to administrative overhead associated with it, particularly when excess capacity situations occur multiple times per year. 3PLs also are usually not used to solve short-term warehousing needs. Increasing base capacity to cover all the peaks of inventory levels throughout the year cannot be an option due to its inefficiency (max base capacity). Short-term subleasing can be difficult to execute—it can also cause excess sublease duration problem that is the same kind of sunk cost (base plus sublease). Flexe's on-demand warehousing services address all these issues. It provides additional capacity (buy space) only when it is needed with no minimums, while also providing an option to deal with over-capacity issues (sell space). Figures 3 and 4 show differences in capacity utilization and cost reduction for three different warehousing models (max base capacity, base plus sublease, and base plus on-demand warehousing) with a single peak and multiple peak scenarios.

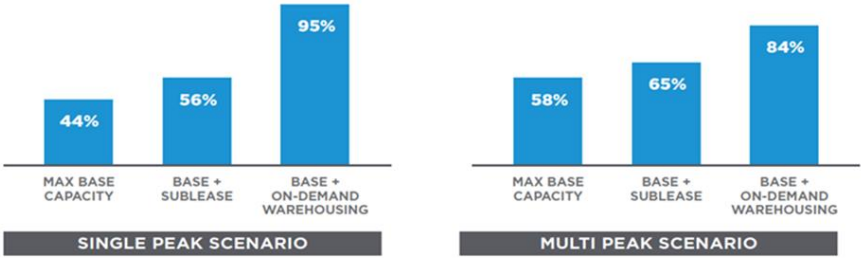

Fig. 3. Capacity Utilization for Three Warehousing Models with Single Peak and Multiple Peaks (Source: [11])

As shown in Figure 3, matching capacity closely to actual inventory levels (base plus on-demand warehousing) drives significantly higher utilization—upwards of nearly 100% improvement in a single peak scenario. Even in a multi-peak situation, on-demand warehousing can drive utilization over 40% higher. This improvement in

capacity utilization has a direct impact on warehousing costs as illustrated in Figure 4. The on-demand (dynamic warehousing) approach is nearly 100% (and 26%) more efficient than a max capacity (static warehousing) model in a single peak scenario (and a multi-peak scenario). It is also notable that the cost mark-up across the three models also differs (Figure 4).

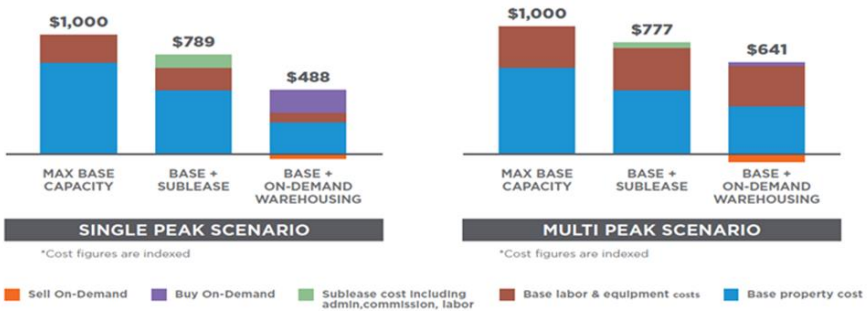

Fig. 4. Cost Reduction for Three Warehousing Models with Single Peak and Multiple Peaks (Source: [11])

As shown in the above figures, Flexe's on-demand warehousing services reduce warehousing operation costs significantly by increasing the utilization of warehouse capacity. The better utilization of warehousing capacity may also reduce energy consumption used for warehouse operation, e.g., electricity. In other words, shared value (not only economic value, but also social value) can be created by collaborative logistics systems, such as Flexe's on-demand warehousing services.

4.2.1. Socio-Technical Barriers: Findings from Interviews

There are barriers, however, that should be addressed for collaborative logistics systems to achieve full benefits. They are both technological and social. A major technological challenge is to build neutral digital platforms that interconnect warehouse operators and allow them to interoperate in a truly automated and seamless format without human intervention. A VP of business development of Flexe states:

"We have developed our own cloud-based software, which interconnects warehouses in North America. A particular customer once set up with Flexe's system has access to a warehouse in any geographical locations in North America in an on-demand format without having to sign a lease or invest a ton of money and capital for starting up a facility. Our system also provides our customers with a clear visibility of control over the movements of goods and the duration of the shipments. However, managing different levels of complexity that customers require in warehousing operations is a barrier. Imagine they can just go online and book a shipment in a warehouse, plan a route, move the goods, and all that in a completely automated fashion. The challenge is how we can make this more automated and seamless, given that everybody's supply chain is unique in some way. That's where we are thinking of the

collaborative logistics systems, namely the interconnection of logistics systems that are based on interoperable and standardized processes."

A major social barrier is a difficulty developing a business model that motivates warehouse operators to collaborate and participate in collaborative logistics systems. As mentioned earlier, they would not share resources (warehouse capacity) unless they recognize the economic and social value created from it. A VP of business development of Flexe continues:

"We create value through a marketplace connecting supply and demand. If you are sitting on an empty space, as warehouse operator, it is a cost. We add revenue streams to empty footprints by commercializing them and make them accessible to the demand side of the marketplace. On the customer side, we give our customers on-demand access to a larger footprint than they would otherwise have access to. Flexe's cloud-based platform also streamlines material handling operations. It requires no technology investments, long-term leases or process interruptions. Adding warehousing and distribution capacity is now easier, more flexible and more cost-effective than ever before."

5 Conclusions

Investigating two different companies closely, ES3 and Flexe, this research examines how collaborative logistics systems create shared value, i.e., both economic and social value. To supplement the case studies, we also conduct a couple of interviews with top managers of the two companies.

Collaborative logistics systems create shared value by providing neutral platforms (physical, digital, or both) where participants can share resources and collaborate with one another. The two case studies on ES3 and Flexe show that collaborative warehouse and trucking and on-demand warehousing services significantly decrease supply chain costs, including inventory-handling costs and transportation costs, as well as societal (or environmental) costs, such as carbon emissions and energy consumptions, associated logistics and transportation.

However, collaboration is challenging, and the potentials of collaborative logistics systems might not be fully realized unless socio-technical barriers are overcome. Therefore, this research highlights the requirements for addressing socio-technical barriers to create shared value from collaborative logistics systems. The requirements for addressing technical barriers are: 1) the development of a platform that is interoperable and standardized, 2) the development of a network of interconnected warehousing capacity that are truly automated and seamless with minimum human intervention, e.g., automated shipment scheduling, inventory tracking, billing and legal agreements. On the other hand, the requirements for addressing social barriers are: 1) increased awareness of social harms reduced from collaborative logistics systems, 2)

trust building through a neutral platform, on which nobody has a home court advantage, and that have strict guidelines about what to share and what not to share, and 3) savings built into the rate charged to participants so that they can see the benefits of collaboration, so-called "collaborative advantage." Only when these requirements (for collaboration) are sufficiently met, the full potentials of collaborative logistics systems will be realized, and shared value will be created.

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