GIẢI PHÁP VẬN CHUYỂN XANH CHO GIAO HÀNG CHẶNG CUỐI - NGHIÊN CỨU TRƯỜNG HỢP CỦA AMAZON VÀ HÀM Ý CHO DOANH NGHIỆP TẠI VIỆT NAM

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Tóm tắt

Do tầm quan trọng trong ảnh hưởng đến logistics cần tổng thể và cam kết xanh, quy trình giao hàng chặng cuối cần được quan tâm đặc biệt để được tối ưu hóa và bền vững hơn. Amazon, gã khổng lồ thương mại điện tử thế giới, đã và đang giải quyết vấn đề vận chuyển xanh của họ trong việc giao hàng chặng cuối. Các tác giả của bài viết đã tìm hiểu cách Amazon khởi xướng dịch vụ giao hàng chặng cuối như một giải pháp cho vận tải xanh để rút ra bài học và khuyến nghị cho các doanh nghiệp tại Việt Nam. Các tác giả thực hiện nghiên cứu định tính với dữ liệu thứ cấp được thu thập từ nhiều nguồn như tài liệu nghiên cứu trước đây, tạp chí, báo cáo, bài báo trong và ngoài nước và dữ liệu chính thức từ các chính phủ và tổ chức trên thế giới. Kết quả cho thấy Amazon đã được hưởng lợi từ dịch vụ điểm nhận hàng và nền tảng kết nối trực tuyến cho dịch vụ vận chuyển cộng đồng như một giải pháp cho vận tải xanh. Từ đó, một số hàm ý được rút ra cho các doanh nghiệp Việt Nam trong việc khuyến khích áp dụng vận tải xanh trong giao hàng chặng cuối.

Từ khóa: Amazon, Giải pháp vận tải xanh, Giao hàng chặng cuối

GREEN TRANSPORTATION SOLUTIONS FOR LAST-MILE DELIVERY - AMAZON CASE STUDY AND IMPLICATIONS FOR ENTERPRISES IN VIETNAM

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Abstract

Due to the importance in affecting the overall logistics costs and green commitment, the last-mile delivery process deserves particular attention in order to be optimized and be more sustainable. Amazon, the world's ecommerce giant, has been solving their green transportation issue in last-mile delivery. The authors of this paper aim to understand how Amazon initiated last-mile deliveries as a solution to green transportation to draw lessons and recommendations for enterprises in Vietnam. The authors conducted qualitative research with secondary data collected from multiple sources such as prior research papers, journals, reports, foreign and domestic articles and official data from governments and organizations over the world. The results show that Amazon has benefited from Pick-up point service and Matching platform for crowdshipping service as a solution to green transportation. Therefore, some implications are drawn for Vietnamese enterprises to encourage green transportation adoption in last-mile delivery.

Key words: Amazon, Green transportation solution, Last mile delivery

1. Introduction

In the dynamic landscape of modern commerce, the last mile of product delivery accounts for nearly 30% of the total cost of transporting goods, and it is the most expensive and time-consuming process in the entire supply chain. Besides, optimizing last-mile delivery is an important task for businesses interested in sustainable development and environmental protection. Last-mile delivery represents a critical juncture where environmental concerns intersect with logistical efficiency. As global awareness of climate change and sustainability intensifies, businesses are compelled to rethink their transportation strategies. This research paper delves into the realm of green transportation solutions, focusing on the vital arena of last-mile delivery. Through an in-depth examination of Amazon's case study, a giant in e-commerce and logistics, this study aims to extract valuable insights and draw implications for enterprises in Vietnam seeking environmentally responsible and efficient last-mile delivery practices.

Vietnam, a burgeoning economic hub in Southeast Asia, is experiencing a surge in e-commerce activities, amplifying the urgency for sustainable last-mile delivery solutions. As enterprises in the country grapple with the dual objectives of meeting customer expectations and adhering to eco-friendly practices, the findings from this research endeavor provide helpful recommendations in their last-mile deliveries. In an era where corporate sustainability is no longer a choice but an imperative, understanding and implementing green transportation solutions in the last mile becomes a strategic imperative for enterprises navigating the evolving landscape of commerce in Vietnam.

This research "Green transportation solutions for last-mile delivery - Amazon case study and implications for enterprises in Vietnam" presents not only an in-depth analysis of last-mile deliveries in the case of Amazon but also a bridge between a global ecommerce giant and enterprises in Vietnam. Our research revolves around 3 pivotal questions: (1) How has Amazon solved their green transportation problems of last-mile deliveries? (2) What is the current practice of last-mile deliveries in enterprises in Vietnam and what challenges have they encountered? (3) What actionable recommendations can be derived from Amazon's experience

to empower Vietnamese logistics firms in solving green transportation issues in last-mile delivery?

2. Theoretical framework

2.1. Green transportation

Several relevant authors have different insights in defining green transportation, which made it become a widely recognized concept. As outlined by Marcus Thiell (2011), green transportation encompasses methods of moving people and goods that avoid detrimental effects on the environment, particularly the use of fossil fuels. Green transportation relies on sustainable energy sources, including wind and solar energy, hydroelectric power, and biomass, among various other alternatives. According to Björklund (2011), green transportation refers to transportation methods that have a lesser detrimental effect on both human health and the environment compared to current transportation options. It encompasses a combination of technologies that involve maximizing the use of conventional fuels, employing electric vehicle technologies more efficiently, utilizing biogas as a bus fuel, and enhancing public transportation services (Lee et al., 2017). Banister et al. (2008) generalized green transportation as a method of decreasing the necessity for travel to minimize both the number of trips and the distance covered per trip by shared vehicle. It is further supported by embracing digitalization, such as smart applications or mobility-as-a-service solutions, offering diverse intermodal options and multimodalities for passenger transportation. This entails presenting consumers with a range of mobility choices, actively encouraging a shift away from reliance on automobiles.

2.2. Last mile delivery

2.2.1. Definition of Last-mile delivery

Last-mile delivery is the key contributor to local economic vitality, urban life quality, accessibility and competitiveness of the firms conducting logistics activities. This not only creates difference and competitiveness for companies but also prompts retail investors to invest in initiative in last-mile delivery innovation. Thus, it is essential that the last-mile delivery is clearly defined and carefully researched. By definition, the term "last-mile" originated in the telecommunications industry and refers to the final leg of a network.

Early definitions of "last-mile" were narrowly denoted as the "extension of supply chains directly to the end consumer"; that is, a home delivery service for consumers (Punakivi *et al.*, 2001; Kull *et al.*, 2007). Gevaers (2013) defined last-mile as the last stretch of the delivery service in which goods are shipped from businesses to consumers (B2C) from the point where the order is placed to the destination predetermined by final customers. Meanwhile, other definitions suppose that last-mile delivery is also used for other business transactions, including B2B (business to business) or C2C (customer to customer). That said, existing definitions fails to capture the complexities prompted by e-commerce, for example, the lack of origin definition (Esper *et al.*, 2003; Kull *et al.*, 2007; Gevaers *et al.*, 2011; Ehmke and Mattfeld, 2012; Dablanc

et al., 2013; Harrington *et al.*, 2016); the exclusion of in-store order fulfillment process as fulfillment option (Hübner, Kuhn and Wollenburg, 2016); and/or non-determination of the end point, including failure to capture the collection delivery point (CDP) as a reception option (Esper *et al.*, 2003; Kull *et al.*, 2007). Other synonyms, including last-mile supply chain, last-mile, final-mile, home delivery, business-to-consumer distribution, and grocery delivery, among many others, have also been used.

All above definitions emphasize last-mile delivery as the last segment of the delivery process. Indeed, this is also the most expensive, least efficient section with alarming environmental concerns (Gevaers et al., 2011). In this report, we decided to define "Last-mile delivery" as the last part of the delivery service and goods ordering process in which goods are shipped to the final customers at home or at collection and delivery points.

2.2.2. Roles of Last-mile delivery

Due to the rising need for quick delivery and instant profits, last-mile delivery is becoming increasingly important for companies to meet customer needs and maintain a competitive advantage in the market (Francescangeli, 2023). By utilizing last-mile delivery, sales businesses can deliver goods directly to customers in a shorter time, at lower cost, and save fuel and human resources, which then enhances the productivity and operational efficiency of the business. This helps businesses reduce costs and increase profits. In addition, for customers, having goods delivered directly to consumers will be more convenient than having to purchase products offline. Furthermore, with convenient and efficient delivery service, delivering goods directly to customers will help improve customer satisfaction.

This is a great competitive advantage, especially for e-commerce businesses. Given the above benefits, last-mile delivery services are greatly influencing the rise of e-commerce.

2.3. Green transportation solutions for last-mile delivery

In reality, freight transport is an indispensable part of last-mile delivery, and it is found to create negative externalities including environmental issues, traffic congestion and accidents and energy consumption as a result of urban traffic. According to Statista (2023), in 2021, Amazon logistics accounted for 1,100,000 MT of carbon dioxide in terms of last-mile emissions. Worse still, the security aspect, the lack of critical mass in organizing transport for shipment, along with the related non-delivery problem in which recipients are not present on the delivery of goods, among many others, has resulted in frequent delivery failure and high empty trip rates (Gevaers et al., 2011). These unattended parcels may involve several times of costly attempt-delivery, which leads to reduced efficiency, increased cost and reduced environmental performance (i.e. high CO2 emissions), making this problem an increasing concern for logistics companies.

Given the aforementioned demerits of last-mile delivery, in this essay, we are proposing two green transportation solutions that have been successfully implemented by Amazon, among many other firms conducting last-mile delivery, including pick-up point (PP) service and online matching platform for crowdshipping.

2.3.1. Pick-up point service

a. Definition

Currently, the most popular format of last-mile delivery is home delivery; however, this is an unfavorable option given its disadvantages in terms of economic and sustainable aspects (Boysen et al., 2021). Thus, various research has been conducted with an aim to optimize last-mile delivery systems so as to be more cost-saving, flexible, fast and sustainable. Among these solutions, pick-up points (PP) is considered a potential delivery option (Mangiaracina et al., 2019).

Self-collection in last-mile delivery encompasses a wide variety of definitions, and as pick-up points (PP) is a form of collection and delivery point (CDP), it is necessary that the definition of CDPs be cited and analyzed. Weltevreden (2008) defined CDPs as the automated or human-run places of the third party in which customers can receive or return the items they purchase. While CDPs come in various forms, these places are normally categorized into supervised and unsupervised collection and delivery points. This end-delivery option is found to be of utmost importance in the reorganization of commercial and logistics activities in last-mile delivery (Augereau & Dablanc et al., 2008).

As already analyzed above, CDP is defined as places carefully chosen by logistics operators where customers can come to return or receive items at ease. CDPs can be classified as unmanned (Parcel locker/Smart locker) or manned (Pick-up point). As Parcel locker/Smart locker involves certain disadvantages, including but not limited to, limited parcel size and/or obstacles to the tech illiterate, pick-up points have emerged as an alternative. By definition, pick-up points are stores providing parcels drop-off and pick-up services (Eleonora et al., 2014). This method, although less time flexible than Parcel locker/Smart locker, better suits the tech illiterate, entails higher security and allows for oversized parcels to be handled (Mangiaracina et al., 2019; Weltevreden, 2008).

To sum up, pick-up point service includes parcel lockers and pick-up points. While parcel lockers are unmanned, collection points are stores of the third party where the store assistant supervises the receiving and returning of the goods. Customers will place orders, make advanced payment and then pick items up at these places under the supervision of the store assistant.

b. Green effects of Pick-up point service

Given the above-mentioned environmental issues of last-mile delivery, pick-up point service is considered to be an eco-friendly solution compared to direct home delivery.

As already mentioned above, failed delivery was found to be one of the major contributors to environmental issues of last-mile delivery. According to the Fixing Failed Deliveries report by Loquate, the average first-time delivery failure rate was 7% in Germany and 6% in the UK in 2020. When delivery attempts fail, customers have to go to a local depot to pick up their items after 2-3 times of missed home delivery. Even the shortest average distance of 13 km (R. Niemeijer, P. Buijs et al., 2023) generates a total of 3,113g CO_2 when driving a car and 1,340g CO_2 when using public transport. This thus reveals that the majority of CO_2 emissions are associated with failed deliveries.

Pick-up point service, however, offers simpler and more efficient routing strategies when customers come and pick-up their ordered items at once. According to the report of Last Mile Expert, parcel lockers and pick-up points are found to significantly reduce the number of failed deliveries, with first-time delivery success rate rising up to 99% for most items (excluding cash on delivery or seller-push products).

Parcel lockers are thus highly regarded and popular in Sweden, France, United Kingdom, Poland, Hungary, Finland, Czech Republic, Belgium or the Baltic States where there is a dense parcel lockers network. The Kantar research in 2022 showed that 85% of online shoppers consider Parcel Lockers to be the most environmentally-friendly delivery option. According to the latest survey by Geminus, in Poland - the country with the largest number of Parcel Lockers in Europe, parcel locker delivery remains the top choice among online shoppers, with over 67% of respondents reporting that they use this delivery option frequently.

Similarly, collection points help reduce the number of carbon-emitting vehicles required to make deliveries, eventually minimizing the carbon footprint. According to the survey conducted by R. Niemeijer, P. Buijs (2023) for customers' transport mode choice when picking parcels, 35.1% of respondents went on foot (accounting for 18.2% of total customer travel distance), and 32.2% by bike (accounting for 28.3% of total travel distance). For the respondents taking the car, 60.0% was part of a trip chain while 40.0% of the car trips were fully dedicated to collecting a parcel. This result, compared to the full utilization of fossil fuel-run vehicles for delivery (i.e trucks and vans), suggests the large volume of CO2 emissions when choosing pick-up point delivery option.

According to the Green Generation report, 62% of customers pick up their parcels on their way to other places (for example, on their way to work, to school or to supermarkets). Customers in densely populated urban areas may prefer traveling on foot or by bike for reasons other than the distance to the pickup point (R. Niemeijer, P. Buijs et al., 2023). Some people are also willing to choose a bike or electric motorbike - a form of environmentally-friendly mode of transport, which further reinforces pick-up points as a green delivery option. This is because cyclists had 84% lower CO2 emissions from all daily travel than non-cyclists, as stated in Transportation Research Part D. Volume 93, April 2021.

2.3.2. Online matching platform for crowdshipping

a. Definition

Crowdshipping is found to be one of the "disruptive innovations" vividly discussed these days (Punel, Ermagun & Stathopoulos, 2018). Therefore, a large body of literature has been conducted in this topic over the past few years. In order to provide a general overview about online matching platform for crowdshipping, we refer to the most recent papers related to crowdshipping, including matching supply and demand in the sharing economy (Boysen, Briskorn, & Schwerdfeger, 2019), a dynamic crowdshipping model and daily travel behavior (Allahviranloo, M. & Beghestani, A. (2019) and last-mile delivery in general (Boysen, Fedtke, & Schwerdfeger, 2020). All these papers give a compact overview on the field of crowdshipping.

The growing popularity of crowdshipping, which is the application of private drivers for delivery of other peoples' shipments on trips they would make anyway (Behrend & Meisel, 2018), is given rise to by the booming of e-commerce and the sharing economy. To be more specific, crowdshipping is the attempt of retailers (e.g., Amazon Flex of Walmart) and specialized online platforms offering a matching of supply and demand as a service (e.g., Uber Freight or postmates.com) to transfer the basic idea of the sharing economy to transport services (Boysen, Emde and Schwerdfeger, 2021).

In order to successfully optimize crowdshipping, a matching mechanism, or an online matching platform based on driver, is thus required. Specifically, driver-based crowdshipping applies to private drivers paid by the hour, hired in advance for prefixed time-lots. This has been given various examples in the reports of Arslan et al. (2018). When matching supply and demand of driver-based crowdshipping via a central platform, we have multiple retailers with varying pick-up points for their shipments and private drives that announce their willingness to deliver dynamically over time. Up to now, various studies have been conducted as to the construction of a suitable online matching platform for crowdshipping. The study of Mofidi and Pazour (2019) shows how a platform can match crowd shippers and demand requests with the use of personalized recommendations. Setzke at al. (2017) proposes a solution approach based on network flow formulation. Akeb, Moncef, and Durand (2018) present a collaborative solution strategy, in which crowdshippers pick up and deliver parcels for the recipients. Behrend and Meisel (2018) combine the ideas of item-sharing and crowdshipping of homogeneous items, allowing each demand to be fulfilled from each supply location.

This report, however, focuses on an online platform that matches supply and demand of driver-based crowdshipping. This has a single central pickup-point (i.e. the distribution center or sales outlet which is the origin of all deliveries) and our drivers have a fixed destination (their home) to return to.

b. Green effects of online matching platform for crowdshipping

Crowdshipping (or Crowdsourced shipping) represents a shipping alternative to traditional delivery systems, which is particularly suitable for e-commerce. This is considered as one of the green solutions for the optimization of last-mile delivery as it can reduce pollution and congestion by eliminating dedicated freight trips. However, the efficiency of this delivery option depends on several factors, among which the match between supply and demand plays the key role.

One of the problems associated with crowdshipping is empty miles, which means that a significant amount of energy is wasted on powering empty trucks or partly-empty vans in last-mile delivery. This is mainly attributed to commercial freight companies having no systems or markets in place to combine different client orders in one vehicle and/or pick up additional jobs on a return journey. According to Optimizing Commercial Freight by Amanda Ahl Matthew Bravante (2021), 20-40% of road carrier distances are traveled with no load. If carriers were to get rid of these empty miles, they could achieve a 6.4-12.8% reduction in all equivalent freight ton kilometers. In the U.S. alone, 72 million metric tons of CO_2 are released each year due to empty miles, which is about 4% of U.S. transport emissions, as stated by Convoy. According to DHL, about 24% of e-commerce parcel space is shipped empty.

Online matching platform for crowdshipping provides a solution to empty miles, thus reducing the amount of excessive CO_2 released by empty or half empty trucks or vans. Loadsmart, for example, designed an AI-based online matching platform for dry vans and reefers in the U.S, which reportedly contributes to 0.7 million tons of CO_2 emissions reduction per annum. Another start-up, Convoy, uses AI to match carriers and shippers in the U.S., and supports load bidding. According to its estimate, the amount of trucking CO_2 emissions will be reduced by 32 million metric tons if this matching platform is adopted throughout the U.S. In addition, Flock Freight - an AI tech company, uses AI to pool shipments into full, shared truckloads, which can cut freight- related carbon emissions by up to 40%. Last but not least, Ontruck's platform aimed at matching less-than-load or medium-haul trips has also avoided 1.9 million empty kilometers (3,749 tons CO_2).

3. Analysis of green transportation in last-mile delivery of Amazon

3.1. Overview of Amazon

3.1.1. General information of Amazon

Amazon, one of the global e-commerce giants, was founded in 1994 by Jeff Bezos and has since become a prominent player in the world of online retail. The Amazon.com website is a massive online marketplace that offers a wide range of products and services, connecting sellers from around the world with customers.

Since its inception in 1994, Amazon has grown exponentially and serves millions of customers globally. Amazon's impact on the e-commerce industry and its continuous innovation in various sectors, focusing on e-commerce, cloud computing, online advertising, digital streaming, and artificial intelligence, have contributed to its significant influence on the global market. Amazon has consistently maintained a strong position in the corporate world, being at the top of Interbrand's global brand list (Forbes, 2022).

3.1.2. Vision – Mission

Amazon's mission statement: "to be Earth's most customer-centric company" is a commitment to providing attractive e-commerce services to its customers and emphasizes the importance of customer satisfaction. Besides, Amazon's vision statement is "to become Earth's Best Employer and Earth's Safest Place to Work" (Pereira, 2023), indicating that the company seeks to be the world's best employer and safest place to work while concurrently striving to be the leading e-commerce company worldwide.

3.1.3. Business model and business performances

Regarding the business model

Amazon's business model is a multifaceted ecosystem that has disrupted traditional retail and reshaped the e-commerce landscape. Its business model comprises several key components, including e-commerce retail, Amazon Web Services (AWS), Amazon Prime, a thriving marketplace for third-party sellers, data analytics and advertising, and a sophisticated logistics network. Amazon's customer-centric approach places a strong emphasis on customer

satisfaction, offering convenience through services like one-click purchasing, personalized recommendations, and customer reviews. The company's competitive advantages include its vast scale and infrastructure, technological innovation, the success of its Prime membership program, a marketplace model that expands its product catalog without heavy inventory investment, and effective utilization of customer data for targeted advertising. It leads to generating multiple revenue streams and helping Amazon become a success in the e-commerce and technology industry.

Regarding the business performance

Table 1: Amazon's business performance in the period from 2018-2022

Year / Annual Data	2018	2019	2020	2021	2022
Revenue	$232,887	$280,522	$386,064	$469,822	$513,983
Gross Profit	$93,731	$114,986	$152,757	$197,47	$225,152
Operating Income	$12,421	$14,541	$22,899	$24,879	$12,248
Pre-tax income	$11,261	$13,976	$24,178	$38,151	$-5,936
Income after Taxes	$10,064	$11,602	$21,315	$33,360	$-2,719
Income from Continuous Operations	$10,073	$11,588	$21,331	$33,364	$-2.722
Net Income	$10,073	$11,588	$21,331	$33,364	$-2.722

(*Unit: Million USD*)

Source: Macrotrends 2023

As illustrated in Table 1, during the period from 2018 to 2022, Amazon displayed significant financial dynamics. Notably, the company's revenue exhibited a consistent upward trajectory, rising from $280,522 in 2018 to $513,983 in 2022. This remarkable revenue growth reflects Amazon's unwavering market presence and its continuous expansion endeavors. Furthermore, the gross profit showed a consistent increase, rising from $114,986 in 2018 to $225,152 in 2022, highlighting the company's skillful cost control and increasing profitability.

However, despite being one of the largest beneficiaries of the COVID-19 pandemic, the company struggled to find new opportunities during the post-lockdown period. This was due to the cooling down of digital demand of customers, as seen by a decrease in the amount of time spent inside and in the intensity of remote work.

3.2. Amazon pick-up point service

3.2.1. Current practice of Amazon pick-up point service

The rapid growth of e-commerce and home delivery has imposed increasing pressure on urban freight distribution systems, with a significant demand for dedicated, fast and sustainable delivery to end consumers. Amazon, who stands out as the largest e-commerce player in the US and UK, also has to face rising competition from traditional retailers who allow more satisfying delivery options. This drove them to a board effort of speeding up delivery times to consolidate its growing multi-billion dollar logistics bill (Staff, 2016), which leads to the

introduction of Amazon Hub Family, designed to provide the ultimate convenience to customers via collection points. In 2019, Amazon started with the first launch of Amazon Hub Lockers, which covers Locker, Locker+ and Apartment Locker, and Amazon Counters in the U.S.. The Amazon Hub Family model typically links last-mile delivery with other related businesses such as convenience stores, gas stations, grocery stores, ect., which benefits customers in terms of time-saving and flexibility and carriers in terms of money, time, and energy saving (Fang, 2019).

Amazon Hub Lockers

Amazon Hub lockers are typical lockers that are in a variety of sizes, serving as an unmanned pickup and return point where customers receive parcels, return or even send parcels from lockers to lockers, or lockers to home (Schaefer & Figliozzi, 2021). In the perspectives of Amazon leaders, the Amazon Hub locker was also a tool to address frustrations from property owners, carriers and residents concerning package delivery (Howland, 2018). Delivery to a Parcel Locker provides users with more flexibility and security. Before proceeding to checkout on the website, customers could search for an Amazon Locker location easily based on the address or zip code provided by them, and then add it into their address book. Once the checkout process is completed, the delivery confirmation which contains simple instructions, a code, barcode needed for picking up would be sent to the customers via email. Amazon's carriers will then carry the parcels to the pickup location on a specific date, and the customers can key in a code in their locker to access their packages.

Amazon first implemented this locker station model in 2011 in the U.S, and by 2018, this model had been successfully operated in over 900 cities in the State (Holsenbeck, 2018). Up to 2019, Amazon has had more than 2,800 lockers covering approximately 70 major metropolitan areas in the US (International Post Corporation, 2019). As the largest e-commerce company in the U.S, Amazon has made the biggest attempt to simultaneously cut rising costs and improve the customer's picking up experience in last-mile delivery, by spreading this "Click and Collect" model to all segments of its potential customers. For instance, in 2018, Amazon's Hub delivery locker system has expanded to reach millions of apartment dwellers and college students in the U.S under the Amazon Apartment Locker and Amazon Locker Service at Universities. Also, as a leader in the e-commerce industry, Amazon has made its attempt to spread its automated parcel machine networks over 27 EU countries since 2016. Since 2016, Amazon Germany, the second biggest market, has offered deliveries that are either directed to homes or to lockers operated by Germany's Deutsche Post DPWGn.DE or picked up from stores with a deal together with the Hermes logistics firm. Thanks to the main driving forces from big online retailers like Amazon, in 2021, there was a 40% increase in the pick-up points across the EU, with a total of 336,000 PUDO locations available, including approximately 43,000 automated parcel machine units (Leenders, 2022). Poland ranked first in the number of automated parcel machines (11,000 units), which was followed by Spain and Germany, with 10,000 and 7,000 units respectively. However, Finland was founded as the most promised plan for the parcel locker service by Amazon as most parcels were preferred by the customers to be delivered in this way (Kivilahti, 2023). In the UK, Amazon first introduced the self-service lockers in 2013, and due to the booming demand for online shopping during Covid, it doubled

the parcel lockers available across Britain and became the main providers of lockers in this marketplace (Mann, 2022).

Amazon chose different locations according to customers' preference in each marketplace as a way of adapting to cultural differences and variations in the customers' behaviors. For example, Fang et al. (2019) took into the consideration of Amazon Lockers location issues in the Los Angeles County, and had detected that most of these self-service boxes were most prominent in convenience stores (eg. Seven-Eleven) where the customers could come and get cheap items for their cheat, which make their pick-up journey more convenient (Table 1). Parallelly, Amazon in a deal with InPost, "the Locker King", had made parcel lockers available in strongly preferred locations by Polish customers, such as proximity to their residential area or on the way to work. (Schaefer & Figliozzi, 2021) has also revealed that while locations near shopping areas and transit stops (eg. in subways or bus stops) were identified as location preference of consumers in Sweden, there were the least attractive locations in the perspectives of Polish customers. The variation in customers' behaviors influenced by different cultures requires logistics companies in general and Amazon in particular to design the locker locations reasonably to drive public demand for this alternative last mile delivery solution.

Table 2: Amazon Locker in Los Angeles County

Type	Count	Share	Notes
Convenience	220	64.9%	7-11
Grocery	32	9.4%	Whole Foods, Albertsons
Parking	1	0.3%	Structure
Gas	26	7.7%	Chevron, Mobil, 76, G&M
Bank	11	3.2%	Chase
Shopping Mall	8	2.4%	/
Education	17	5.0%	UCLA, USC, CSULB, CSUSA
Phone Stores	10	2.9%	Sprint
Stores	7	2.1%	Smoke, Shoe, Printing, Computer, etc.
Others	2	0.6%	/

Office	4	1.2%	/
Apartment	1	0.3%	/

Source: Fang et al. (2019)

Amazon Hub Counters

In 2019, Amazon simultaneously announced the launch of Amazon Counter in both the U.S. and European countries (eg. Italy) including the UK. By definition, Amazon Counter is a new network of staff-assisted pickup point service which provides customers with an additional alternative to pick up their Amazon packages in-store at local retailers who are in partnership with Amazon (Team, 2019). This new model generated great benefits for their stakeholders, both the partners and the customers (Khan, 2023). Counters enable local shops to be Amazon's partners and offer customer service to Amazon customers while building rapport and increasing foot traffic. At the same time, Amazon customers can have a better experience with their Amazon orders, they are flexible to pick-up time, location selection and returning point. Amazon Hub Counters was believed to be a potential alternative pick-up point solution, which relieves the pressure on urban freight distribution systems, solves the customer's pains and strengthens the company's competitive advantages of fast and convenient delivery.

Similar to Amazon Hub Lockers, after completing the shopping procedure, customers who select a Counter pick up point as their delivery location will receive a notification with a unique barcode and other information including the address, opening hours of the selected store, and by showing the barcode to the partner store staff, packages will be retrieved and handed to them. Customers must collect their package within 14 days before their parcels are shipped back to the warehouse. Amazon designed and built the technology for Counter from the ground up, aiming to smoothen the pickup flow at the partner stores to assist store associates to serve customers without disrupting their daily activities (Team, 2019).

In general, Amazon Hub Counters were prevalent in the U.S. and the U.K, and they are typically located in retail stores and serve as additional pickup points for Amazon packages. Starting from May 2019, customers had first access to more than a hundred Counter locations, which were available with Same-Day, One-Day, Two-Day and Standard Shipping at no extra cost across the U.S.. From then the launch of Amazon Hub Counter had received tremendous positive feedback from customers and local partners, which drove Amazon to the expansion of this model with Amazon's new store partners like GNC, Health Mart and Stage Stores at the end of 2019 (Amazon, 2019). Similarly, optimistic feedback was observed from the trials of this model in the UK market, thus leading to a fast growth of Amazon Hub Counter in this country. (Amazon, 2019). Currently, via hundreds of NEXT stores across the UK, Amazon packages are handed to customers securely, fast, economically and conveniently while mitigating the impact of last-mile delivery on the environment. Except for Italy in which Amazon customers could get their packages through thousands of Amazon's partner stores such as Giunti, Fermopoint and SisalPay, Amazon Hub Counters are not yet available in other

European countries. In the case of Spain, Amazon established its connection with local post offices to serve as their collection points, and Amazon is currently partnered with Correos, the national postal service of Spain to better support Spanish deliveries.

3.2.2. Evaluation of Amazon pickup point service

In general the launching of Amazon pickup point service has successfully driven down Amazon's average shipping time (Rubin, 2019), solved the security problem of porch piracy (Shields, 2023; Chaudhuri, 2022), and brought plenty of environmental benefits to society.

Specifically, Amazon has made its last-mile operation more eco-friendly with the proactive solutions to reduce stem time, saving time and fuel and increasing efficiency in last-mile delivery. According to Amazon's sustainability report (Figure 1&2), the carbon intensity, which quantifies total carbon emissions, in grams of carbon dioxide equivalent (CO_2e), per dollar of gross merchandise sales (GMS), has been reduced constantly in recent years thanks to the application of this model. Within the context of the U.S,. Fang (2019) estimated the greenhouse gas emission (GHG) emission would reduce resulting from the application of parcel lockers in Los Angeles County based on the walk score. This research found a significantly positive relationship between the number of parcel lockers available and walking distance of e-consumers, which indicates that the wider the distribution of Amazon Locker, the more carbon footprint is cut down.
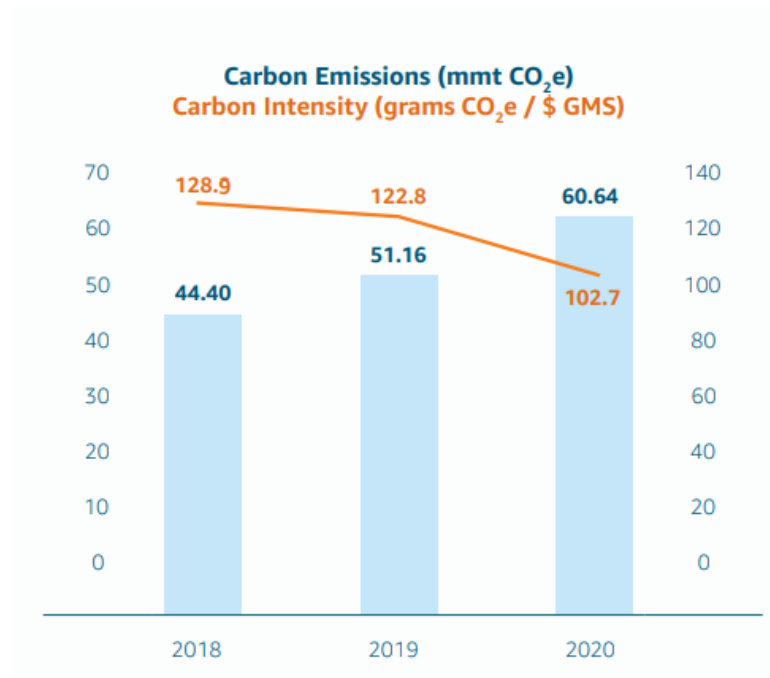

Figure 1: Carbon Emissions & Carbon Intensity

Source: 2020 Amazon Sustainability Report

Carbon Intensity	2019	2020	2021	2022	YoY%
Carbon Intensity (grams of CO_2e per $ of GMS)	122.8	102.7	100.8	93.7	-7%

Figure 2: Carbon Intensity

Parallelly, the rapid growth of Amazon Hub Family in European countries has addressed the sustainability concerns of e-consumers. Strauss et al. (2022) have launched a research on driving factors of parcel lockers over 28 European Countries and came to a conclusion that environmental awareness of consumers plays a vital role to the success of wide distribution of automated lockers. This result is in line with I. A. Mitrea et al. (2020), which found younger online consumers were even willing to pay more for the delivery service if it is more environmentally friendly. According to the Green Last Mile European Report 2023, they expected the wide spread of out-of-home picking service like Amazon Hub family all over the European countries could contribute to about two-thirds of carbon emissions reduction in urban areas and even more in rural areas. In practice, the partnership between Amazon and InPost NPS covers a vast majority of locker delivery in Poland, which managed to fulfill the public desire for eco-friendly delivery practice in this country. The fast growing online purchasing caused frequent parcel deliveries in urban areas, which contributed to loading packed urban freight distribution and increasing carbon footprint (Moroz and Polkowski, 2016; Chen et al., 2017; SCTLC, 2018). In the UK, Amazon acts as a leader on locker's evaluation with about 17%, equivalent to 6,500 lockers, which meet the growing demand for out-of-home delivery and lessen the hard pressure on the UK's urban freight distribution systems (Last Mile Experts, 2023).

Despite serving as a remedy for addressing customer service problems and environmental concerns, Amazon Hub Family is yet a magic and one-fit-all last-mile delivery solution due to several restrictions such as limitation on the parcel styles, mechanical failures, inaccessibility out of business hours, limited locations, ect. Therefore, careful considerations need to be made with the application of this model so that its success can be leveraged to yield more fruitful outcomes.

3.3. Amazon application of matching platform for crowdshipping service

3.3.1. Current practices of Amazon's matching platform for crowdshipping service

Crowdsourcing has been utilized by the e-commerce giant in its investment into the logistics network to ensure more control over the last mile and reduce shipping costs (Khalifa University, 2021), be its ongoing obsession with getting items to customers faster, and reducing dependency on major shipping carriers. In 2015, to compete with Uber Rush, Amazon launched Amazon Flex - a logistics service which allows consumers to become drivers and use their own vehicles to deliver products and groceries to Amazon customers. By associating with Amazon, the retailers can target an additional and cost-efficient solution for their capacity concern of home deliveries (Boysen, Emde and Schwerdfeger, 2021). For drivers, they are contracted directly or further subcontracted by Amazon for goods delivery, which relieves Amazon from responsibility for the drivers who deliver their package (Hassel and Sieker, 2022). . All Flex's associates are presented with time blocks with the average length of the delivery depending on the type of delivery and kind of vehicle used. Deliveries offered through Flex include store orders picked up from local merchants and later shipped to the consumer; PrimeNow and

Amazon Fresh orders picked up from Amazon station and shipped to customers; or Amazon.com orders with the same route but longer time blocks and more packages delivered. Amazon sets the time frame for each block, which consists of fixed deliveries, and any exceeding time deliveries are not paid by the company (flex.amazon.com, 2019). Moreover, drivers on Amazon Flex can access its platform to select suitable deliveries on their route. The Flex application instructs the driver directions for the optimal tour and offers customers guarantees on delivery times such as next-day, same-day, and even two-hour guaranteed delivery windows (Fatehi and Wagner, 2021).

Crowdsourcing last mile delivery can be advantageous in terms of cost-saving as larger amounts of tasks are performed in short periods of time without the need of involving more shippers which ultimately diminishes the risk of having to pay during off-peak times (Khalifa University, 2021). In addition, by adjusting the delivery prices, the company can control the supply of the drivers and then save on employee benefits, fixed wages, the number of delivery trucks, and warehouse storage. However, due to the nature of crowdsourcing, the risk of exceeding quantity over quality and restricted control over crowdsourced workers to deliver packages are concerned by industry reporters even before the application of Amazon. In response, Amazon employed a business mode of using a hybrid delivery fleet of complementing ID vehicles with a fleet of vehicles owned by the service provider, with contracted professional drivers to achieve more reliable service guarantee and enhance customer satisfaction (Goyal, Zhang and Benjaafar, 2023).

In line with increasing cost and the need to move freight fast and on-time, since 2019, Amazon has been testing its new online service matching truck drivers with shippers. Facing major competitors like Uber Freight, C.H. Robinson and XPO Logistics, the company signaled its first foray into the lucrative online freight brokerage space with the launch of its online freight matching platform by announcing Prime free shipping would transition from two days to one. The platform helps shippers find the right carrier for shipped load, based on its characteristics, equipment needs, additional services, and any pickup or delivery appointments. In other words, the brokerage leverages its expertise in matching the demands of those in need of shipping large cargo with carriers having the right capacity at the right rates. The platform negotiates directly with the carriers to find the best rate for its customers. The broker's operations and profit base on the spread between the amount the shipper is willing to pay for the shipping cost of their freights and the final rate that the broker negotiates with the carrier for the shipper. Once booked, the carrier will be the driver collecting and delivering the goods to the destination while the broker will work with the carrier to ensure that freight is picked up on-time and any disruptions such as traffic or weather delays are tracked and systematically managed. Shippers can view instant quotes based on zip-to-zip searches on lanes in New Jersey, New York and Pennsylvania (Hill, 2019). Compared to the existing network of carriers which remains highly inefficient with most work still being handled over the phone or by fax, the launched service better off Amazon's management over its network and expedite the cargo matching process.

Freight brokerage is a solution for shippers who do not have enough time and knowledge to find reliable carriers for their parcels. The freight broker is the middleman between vendors

and those carrying their freight to provide the point of contact between them, which separates it from the freight forwarder who takes ownership over moving goods. The broker routinely utilizes its network of supply chain contacts cultivated over time and acquired through cold-calls and access to online freight-matching marketplaces to connect the shippers with carriers having suitable capacity. The online freight-matching marketplaces or load boards allow the brokers to view available loads within their remit and lanes available to start their bidding and rate negotiating process with the carriers (freight.amazon.co.uk, 2023). Through the transport management system (TMS) and the exchange of electronic data, greater visibility and transparency of the freight journey are ensured with real time updates and load status tracking.

There are 2 main underlying drivers powering the online brokerage platform by Amazon. The first one is the extensive network of trucking carriers as an enormous amount of freight had been directed through Amazon's own distribution and sortation centers. Company executives traditionally insisted that this capacity is meant to supplement existing third-party freight and logistics service providers. Therefore, the launch of the freight brokerage suggests the company is moving towards that practice, boosting capacity beyond immediate need. With its unparallelled networks of enormous number of shippers and carriers, it was only a matter of time before the company leveraged its implicit network effect and connected both sides of its business, reviewed by many industry observers (Hampstead, 2019).The volatile price of trucking capacity is another driver. Amazon entered freight brokerage as a way to reaccelerate its top line revenue, which had been staggering from upward of 30 percent annually before 2018 to less than 15 percent in 2019 (Hampstead, 2019). By building a freight brokerage business with advantages in disintermediation, Amazon hedges against the fluctuating price and monetizes those capabilities in turning part of its costs into revenue, as stated by the Amazon veteran.

Operating its third-party logistics network allows Amazon to blow out retail peak season. By leveraging its extensive network of truck carriers, taking no margin during soft freight seasons and keeping trucks running without many intermediaries, Amazon can have capacity locked up and ready to move truly staggering e-commerce volumes, especially in holiday seasons in November and December.

3.3.2. Evaluation of Amazon online matching platform

Boasting an extensive network of shippers and carriers that are already moving goods through its ecosystem, Amazon has the resources to undercut all of its competitors in terms of price. As such, the company has long had the infrastructure in place to broker the movement of these goods without pouring in a significant investment. This enables them to offer much lower costs than its competitors. Specifically, Amazon's service comes at prices that are 26% to 33% lower than the market, analyzed by FreightWaves. The service lists a rate of $765 to transport freight from Baltimore to Manhattan, a 33% discount from DAT's broker-to-carrier spot rate of $1,139 (Hampstead, 2019).

The implementation of the online brokerage platform has positive environmental implications as it boosts the capacity utilization, matching rate between the shippers and total parcels to be delivered and attracts more shippers to the crowdshipping platform. In a study about the driver-parcel matching problem with time windows, Wenyi Chen showed that the

increased match rate measuring the ratio between the numbers of parcels delivered by the crowd and total number of parcels indicates greener logistics networks as the parcel-miles saved reflects reduction of traffic congestion and CO2 emission. As some drivers may only want to make a small detour to deliver parcels on the trip they are already making, the matching efficiency is significant to allow favorable pickups and drop-offs in a single trip (Arslan et al., 2016).

Firstly, parcel-miles can be saved and a higher rate of capacity utilization can be facilitated by the brokerage platform, thus increasing driver-parcel ratio (Chen, Mes and Schutten, 2017). In other words, a higher rate of capacity utilization is acquired through the digital freight matching technology. As the platform is a real time tracker, it means when a truck is booked, it is automatically removed from the freight brokerage market place, and can also locate and secure truck capacity much faster. If appointments are not properly scheduled or drivers cannot arrive at the appointment window, there will also be risk of load rejections, which render more time and fuel consumed, as stated by mDesign - a home decor company before it used Amazon Freight. Also, the rise of online shopping is in line with more small and disparate packages being shipped, leading to complex fleets with empty miles due to matching inefficiency. Amazon's digital platform is more transparent and easier to coordinate shipments than manually connecting shippers with carriers, which, along with other emission tackling solutions of Amazon drives down 0.4% CO2 emitted in Seattle compared to 2022 (Cargo Convoy Inc., 2023). For rural America where the options of cargo bikes and electric vehicles are not practical as in dense cities such as New York and Paris, the use of small vans to combine Amazon deliveries and improve truck fill rates depends on where and when the truck picks up Amazon packages (Simon, 2023). In this case, the matching platform can help utilize the capacity and avoid trucks with empty miles increasing the gas emission. Amazon is also working on new technology called Dynamic Delivery Planner (DDP) providing solutions to the best delivery routes and sequence multiple routes into a single delivery attempt or optimal combination of orders for multiple delivery attempts, which is for reducing travel time and improving delivery efficiency. As it is integrated in the current transport management system on the freight brokerage platform, it enables last mile planners to quantitatively assess the trade-off between driver workload and delivery efficiency, which further reduces travel time. Aramex Australia operating a last mile courier service developed the DDP jointly with Amazon has observed a 29% improvement in delivery efficiency during their studies (Wu and Baeuml, 2023).

Secondly, reduced CO2 emissions, lower total cost and traffic congestion were observed with an increase in the number of drivers and parcels (Chen, Mes and Schutten, 2017). The sheer size of Amazon's offerings places it in an advantageous position to draw shippers to its platform, since they are already doing business on the firm's core site. And retailers are fascinated about Amazon logistics service — 55% of retailers said they would consider moving their business to Amazon if it announced a parcel delivery service, per iR Research (Aouad, 2019). Shippers engaging with Amazon enjoy freight services without any brokerage fees. They also save a great amount of time posting the load and securing the capacity. The online platform provides transparency in pricing, improved visibility into the supply chain and data analytics to enable better decision-making for shippers (Aouad, 2019). As a result of increased

participation of shippers, more suitable parcels among a relatively large pool of parcels are assigned to the crowd, which facilitates fleet consolidation and significantly reduces overall parcel-miles, consequently restricting CO_2 emission (Chen, Mes and Schutten, 2017).

4. Recommendations for logistics enterprises in Vietnam

4.1. Current practice of enterprises in Vietnam in applying pick-up point service and online matching platform for last-mile delivery

The Vietnamese e-commerce market is widely recognized as a well-established and accelerating sector (Vietnamplus.vn); nonetheless, it poses a lot of pressure on last mile logistics on companies and they grapple with the challenge pertains to the issue of multiple deliveries, which imposes considerable complexities and costs on the delivery ecosystem (Dang, Nhi and Le, 2023). To meet growing customer expectations, optimize costs, increase profits, minimize environmental impact, and survive in the fierce battle, logistics businesses in Vietnam have invested in technology and created competitive advantages on the market. While the number of enterprises currently applying pick-up point service remains limited due to certain obstacles, online matching platforms have become a trend with increasing popularity and adopted by several logistics companies in the Vietnam market.

4.1.1. Pick-up point service

Since 2019, Lazada Express Vietnam has been standing as the sole company offering pick-up point services for last-mile delivery in the country, marking a pioneering step in the Vietnamese market. There are over 300 pick-up points currently operational in the cities of Hanoi and Ho Chi Minh City including collection points and smart lockers. Collection points are third-party establishments, encompassing supermarkets, convenience stores, and pharmacies, such as Pharma City, F88, and HomeFarm (Drop-off point map, Lazada). At these collection points, customers have the option to retrieve their ordered goods through direct human interaction. Besides, Lazada has also deployed smart lockers through the partnership with iLogic - a technology company operating in the sharing economy model in Vietnam logistics industry. These lockers are known as iLogic Smartbox, which are positioned in shopping malls, residential apartment complexes, and university campuses, enabling customers to access their purchased items without the need for human interaction.

To avail themselves of this service, customers are required to follow a series of straightforward steps. Initially, they must input the delivery address and select their preferred pick-up point during the ordering process. Upon completing the payment, the package is dispatched to the designated Lazada Pick-up Point. Subsequently, customers receive an OTP (One-Time Password) code via both email and text message, which serves as the key to unlocking the package. This code facilitates the retrieval of goods within a specified 3-day window. After the lapse of this timeframe, unclaimed packages are automatically returned to the seller (pages.lazada.vn, n.d.)
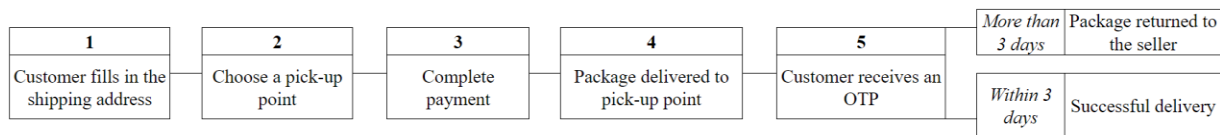
1	2	3	4	5	More than 3 days	Package returned to the seller
Customer fills in the shipping address	Choose a pick-up point	Complete payment	Package delivered to pick-up point	Customer receives an OTP	Within 3 days	Successful delivery

Figure 3: Lazada package pick-up process at pick-up points

Source: Lazada.vn

Notably, a prominent feature of this service is its cost-effectiveness, as it is entirely free for customers. Shipping fees, on the other hand, are still calculated in accordance with Lazada's general pricing policy, similar to home delivery. Customers, however, have the flexibility to choose the most convenient pick-up location and can proactively collect their items at a time that suits their schedule. This distinctive combination of cost savings and convenience underscores the appeal of Lazada's pick-up point service for last-mile delivery in the Vietnamese market.

4.1.2. Online matching platform for crowdshipping

In recent years, crowd logistics platforms have appeared in Vietnam from Vietnamese companies as well as multinational companies and brought enormous benefits to customers. Online platforms facilitate the seamless execution of crowdsourcing by connecting individuals seeking goods transportation with those who are interested in performing delivery services (Le and Ukkusuri, 2019). Below are some typical platforms in Vietnam:

Lalamove

Established in 2013 in Hong Kong, Lalamove is an on-demand delivery platform that was created with the goal of empowering communities by providing fast, uncomplicated, and cost-effective delivery services (Lalamove, 2013). Lalamove's last-mile delivery service in Vietnam relies on a sophisticated online matching platform that connects customers in need of delivery services with a network of independent drivers and couriers through their intuitive mobile application or website. This platform enables real-time matching, ensuring that delivery requests are swiftly assigned to available drivers based on various factors, including location and vehicle type. Additionally, route optimization tools help drivers plan the most efficient delivery routes, reducing both time and fuel consumption. Customers benefit from real-time tracking, instant communication with drivers, and the ability to access proof of delivery, all of which enhance the overall delivery experience.

AhaMove

As a business originating from cross-province logistics, Giao Hang Nhanh established Ahamove to complete the last mile of the delivery process. Inheriting the advantages of the parent company, Ahamove focuses on solving the last-mile problem in big cities by online platforms. When goods arrive in big cities like Ho Chi Minh City and Hanoi, Ahamove's partners - mostly motorbike drivers - will receive orders from the parent company and distribute them to smaller post offices or customers. Giao Hang Nhanh follows the "Hub&Spoke" model and Ahamove's "On-demand" model helps fill the gap, solving the smaller-scale problem for

the parent company (GHN.VN Giao Hàng Nhanh, 2022).

Grab

Also participating in the last-mile delivery market, Grab ride-hailing application also added GrabExpress goods delivery service in Vietnam in March 2017 (Grab, 2017), GrabFood in June 2018 (Grab, 2018), GrabMart in March 2020 (Grab, 2020), and heated the competition. Deployed technologies like demand heatmap, auto-matching, early-matching, route suggestion has helped Grab record a 3.55% decrease in average idle time of driver partners in 2022 and increased 10% of their earnings per online hour compared to the previous year (VCCorp.vn, 2023). Every minute of driver-partner activity on the Grab platform has been maximized and the process of receiving and completing trips has been optimized to become as seamless as possible. The strategic integration of multiple services within a single application for customers and streamlined partner experience has conferred a substantial competitive advantage upon Grab in the marketplace and eliminated the need to seek alternatives, enhancing overall satisfaction and convenience for application users.

4.2. Evaluation of pickup point service and online matching platform adoption of enterprises in Vietnam

Pickup point service, though believed to solve the last mile delivery problem by passing it on to the customer, has failed to penetrate the market due to certain obstacles, and the number of iLogic Smartbox available on the market has decreased over time. The first challenge businesses have to face when applying pick-up point service in their business model is changing customers' payment behavior. As cash on delivery was the most popular online shopping payment method in Vietnam in 2022 (Statista Research Development, 2023), it can be acknowledged that customers prefer services that allow them to pay for the goods upon delivery to minimize the risk of fraud, making it harder to transfer to a delivery service that requires advance payment despite increased security and efficiency. Another significant challenge in the adoption of pickup point services is finding suitable locations and partners. The failure to establish partnerships due to complicated legal procedure and inadequate infrastructure is a substantial hindrance to this transition (Huong Tran, 2020).

In another story, crowdsourcing has become an on-demand service and has gained substantial momentum in Vietnam (Thanh Tuan et.al, 2023). Many researchers have proven that the effective development of crowd logistics brings many benefits in reducing transportation costs, reducing the distance traveled per unit of goods as well as delivery time for logistics companies, shippers and users; from there, it shows that this is one of the breakthrough solutions for sustainable urban development (Buldeo Rai et al., 2017, 2018; Dolati Neghabadi et al., 2019). Originally just for the food & beverage industry, crowdsourced delivery is now being used for a variety of purchases, offering same-day delivery of groceries, medicine, and many other goods. This trend has paved the way for numerous current players and startups in the market, all capitalizing on the potential of crowd logistics to enhance their delivery services.

The adoption of crowd logistics has somewhat reduced last-mile delivery's impact on the environment thanks to the utilization of the empty spaces on individuals' vehicles and technological advancement. For instance, route optimization and multiple drop-offs in the case of Lalamove (Lalamove, n.d.) and Grab (Grab, n.d.) has helped mitigate the impacts on the environment and enhance last-mile logistics efficiency. However, it is not without the risk of increasing pollution and traffic congestion as customers always desire greater convenience and faster delivery, which means increased number of shipping turns and volume (Tran and Pham, 2020). Therefore, it is vital for crowd logistics platforms to start thinking about solutions to the greenhouse gas emissions problem in the urban environment.

4.3. Recommendations for logistics enterprises in Vietnam

Based on the above analysis, current situations, challenges and lessons learned from Amazon, the research team makes some recommendations for enterprises in Vietnam to offer a green transportation solution, which includes introducing Pick-up point and optimizing Crowdsourcing service. Some specific suggestions are as follows.

Promote electronic payment to support Pick-up point service implementation

Most Vietnamese consumers now still choose Cash on Delivery (COD) as their preferred payment method, which poses several challenges for the adoption of Pick-up point service. However, cashless payment has flourished and become a trend in the last year (The State Bank of Vietnam, 2023). Therefore, enterprises need to support and actively participate in expanding e-payments through some initiatives such as increasing payment acceptance points, giving vouchers or discounts for online transactions or strengthening payment security assurance for customers etc. With the increasing adoption of e-payments by consumers, enterprises can ensure higher success in applying the model of Smart Parcel Lockers or Counters – boxes owned by a retailer or a logistics service provider used by different customers, usually grouped into structures located in public places (e.g. supermarkets, post offices) (Wang et al., 2014). By decreasing the number of deliveries and stem time, saving time and fuel and increasing efficiency, this measure will act as a solution to their green transportation issue in last mile delivery.

Build strategic relationships with logistics service providers or merchants

After goods have been delivered, customers can go to Pick-up points to pick them up. They may belong to or cooperate with logistics service providers or merchants and a network of stores as places for lockers and counters (Wang et al., 2014). Hence, to provide the most convenient Pick-up points for customers, enterprises should strengthen their relationships with a network of retailers or postal offices and improve the infrastructure to accommodate the convenience needs of customers. With a strong connection, probability of failed delivery can be minimized and level of satisfaction among customers can be optimized.

Build a suitable business model in crowdsourcing service and adopt digital matching platform between drives and shippers

Crowdsourcing logistics business model supported by online matching platform presents

an effective delivery solution, which is expected to have a great impact on urban logistics in many cities (Wang et al., 2016). By adopting an appropriate model and platform connecting drivers and shippers in an efficient and environmentally friendly manner, enterprises in Vietnam can satisfy on-demand orders with guaranteed delivery time and reduce significant costs. In specific, enterprises should adopt a crowdsourcing model that leverages a network of independent drivers or transportation providers. This can enhance flexibility, scalability, and cost-effectiveness. Drivers can join the platform and offer their services based on demand. In terms of matching platform, a robust digital platform with an intuitive interface should be prioritized. The platform should allow shippers to easily input their transportation needs, and drivers to efficiently bid or offer their services incorporating geolocation, route optimization, and real-time tracking for enhanced efficiency.

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