Analyzing the Influence of Perceived Attributes towards Consumer Adoption of Crowdsourced Delivery in Vietnam

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Abstract

Last-mile delivery played a crucial role in e-commerce success. On-demand and personalized delivery services were required, including flexibility, visibility, and faster delivery. However, Vietnam's last-mile was encountering by national challenges, namely, urbanization issues, poor technologies, infrastructure, and Cash-on-Delivery. They resulted in the pressures on customer fulfillment and operational efficiency. Crowd-sourced delivery was considered as a possible solution to optimize Vietnam's last-mile delivery.

The objectives of the study were to investigate the influence of six attributes in customer intention towards the adoption of crowd shipping in Vietnam. The study supported the understanding of the acceptance of the intelligent alternative from behavioral perspectives. The research could hopefully be generalized as a guideline to identify factors influencing the adoption of crowd shipping. It could provide a knowledge base for enterprises on future developments.

Based on the literature review on last-mile and crowd-sourced delivery, the mixed-method approach, the qualitative and quantitative approaches were used to attain the objectives. The online structured questionnaire was implemented to collect 115 online responses in the anonymous form. The quantitative approach was used to analyze the obtained data. The interviews were conducted with five individuals in association with the desired objectives.

The outcomes of the study suggested a high likelihood of customer intention towards diffusion. Relative advantages and observability had positive significant relationships with customers' intention. The study found no relationship between perceived risks and customers' intention.

Keywords/tags: E-commerce, B2C, Last Mile Delivery, Sharing Economy, Crowdsourcing, Crowdsourced Delivery, Crowd Shipping, Vietnam.
Miscellaneous (<u>Confidential information</u>)

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1 Introduction

1.1 Preface

The popularity of digital-based access reshapes Vietnam's e-commerce. The appearance of the internet service started in 1997. However, the golden age of the internet in Vietnam was in 2017 with a half of population using the internet. The rate of internet usage was higher than the world average at 7.5% by 2017. Moreover, Vietnam ranked the highest growing mobile traffic in 2018 with 73% of the Vietnamese population in smartphone ownership (Fintech news Vietnam, 2018). This has led to an unprecedented booming of e-commerce in Vietnam. E-commerce has become a crucial part of Vietnam's trade. Correspondingly, the customers' shopping behaviors are greatly influenced by e-commerce. Vietnamese consumers are more likely to satisfy their shopping habits at home via their fingertips.

Accelerating online trends generate on-demand economy, which gives the customer instant gratification. Logistics is not an exception in the age of e-commerce. The majority of the shoppers want on-demand delivery to their door-step. To gain success in the online business, last-mile deliveries gain intensive attention from vendors and logistics carriers. Nevertheless, the higher the consumer expectations in e-commerce, the more escalating complexity for the last-mile logistics to provide on-demand deliveries. Vietnamese consumers expect not only fast and reliable service but also service in the most personalized way. The current delivery operations have not worked effectively because they do not meet the fast-growing customer expectations when the process has been historically operated by private fleets or logistics contractors. The traditional collaboration causes challenges in association with inefficiency and ineffectiveness, namely weak technologies, poor traceability and popularity of the Cash-on-Delivery (COD). According to the Vietnam Logistics Association (VLA), logistics expenditures in Vietnam stand at between 10-20% of the gross domestic product (GDP) regarding consumer goods, e-commerce retail, the garment, and the farm industry. Transport was the highest segment of the expense categories with 60-80% in 2018. (Vietnam Net Bridge, 2018). Therefore, retailers are looking for innovative possibilities for the fast and cost-effective delivery.

The concept of a sharing economy has been emerging in various economic fields. Crowdsourcing is a part of this technological phenomenon. The model facilitates the economic treatments of inefficiency and inconvenience in the consumption market. Typical examples of sharing economy are Uber/ Grab in the transportation sector, Airbnb in the hospitality sector, and many more. Crowd-sourced delivery hopefully maximizes last mile operations and achieves customer satisfaction as well. Vietnam is a potential market for adopting the innovative services. More firms consider that crowdsourcing as a strategy when it would offset the losses of delivery inefficiency.

1.2   Objectives

The research was implemented to review the existing literature related to crowd-sourced delivery and its applications to the B2C e-commerce market, particularly in the Vietnam e-commerce market. The objective was to gain a profound insight into the research background (e-commerce, last-mile logistics, innovation adoption), and identify the existing challenges in the researched market. In addition, the study investigated the perceived attributes of innovation adoption. The implication was to consider if the innovation would be supported by the potential adopters.

The research questions of this study were as follow:

    a. To what extent do perceived attributes influence the consumers' adoption of crowdsourced delivery in Vietnam?

    b. How does crowdsourced delivery solve the current challenges of Vietnam's last-mile delivery?

    c. How should retailers concentrate on the application of crowdsourced delivery in Vietnam?

1.3   Research Limitations

This study had potential boundaries. This study concentrated on last-mile deliveries in the developing Pacific-Asian nations. More particularly, the focus of this study was on the B2C e-commerce in Vietnam in the field of last-mile deliveries. Crowdsourcing technology was mainly considered within highly dense urban areas of Vietnam. The

choice was made to limit the research on the parcel-sized delivery, which is preferable for crowd shipping. Therefore, other types of goods with larger sizes were excluded from the study.

Secondly, studies related to topic are limited in quantity, due to the new topic. Additionally, the source access restriction was found a barrier of guaranteed data collection because of a high subscription cost. Apart from academic studies, commercial reports and trade press were preferable to use in the literature review. All data were ensured to be freely available and easily accessible from source citation. In terms of the research reliability, the sources were carefully cited by logistic-specialized publishers and logistics providers. Thus, the collected data was moderately acceptable and fully consistent with the research knowledge and objectives.

Lastly, the effect estimates in the research were based on literature reviews and prospective observations. Moreovers, the data was collected by using the online survey with a small sample size and time limit. Moreover, Roger's six main characteristics of innovation were analyzed. Other factors influencing the customer intention were excluded from the research. Thus, the restriction of the sample size and mandatory content may reduce the generalization of the results.

1.4   Research Methods

The quantitative and qualitative approaches were conducted in the study. In the quantitative research, the online survey was used to examine the consumers' intention towards the adoption of crowdsourced delivery in Vietnam. Hypotheses, constructs, and variables were analyzed to transform into usable statistics. The method provided statistical and unbiased results. Furthermore, the qualitative method, more particularly interviews, were used to gain an understanding of the customers' opinions and motivations in the adoption. The findings of the mixed-method research provided insights into the consumers' motivation in using the crowd shipping.

2 Literature Review

2.1 Last-mile Delivery

Definition of Last-mile Delivery

The term "last-mile" is itself clearly defined. The origin of this term comes from the telecommunications industry. In Broadband Reference Guide (2014), last-mile represents the final part of the telecommunications networks through which the connection services are provided to the location of the individual users from the service provider. The concept of "last mile" has gained high popularity in the sector of logistics and transportation.

Johnsen, Howard, and Miemczyk (2014, 432) define last-mile as follows:

"The last-mile delivery service is delivering to the final consumer of the product, the last part of the chain from the manufacturer through the distribution system to the point of use."

The flow of products to the final customers is clearly illustrated by the structure of e-commerce supply chain, as shown in Figure 1:
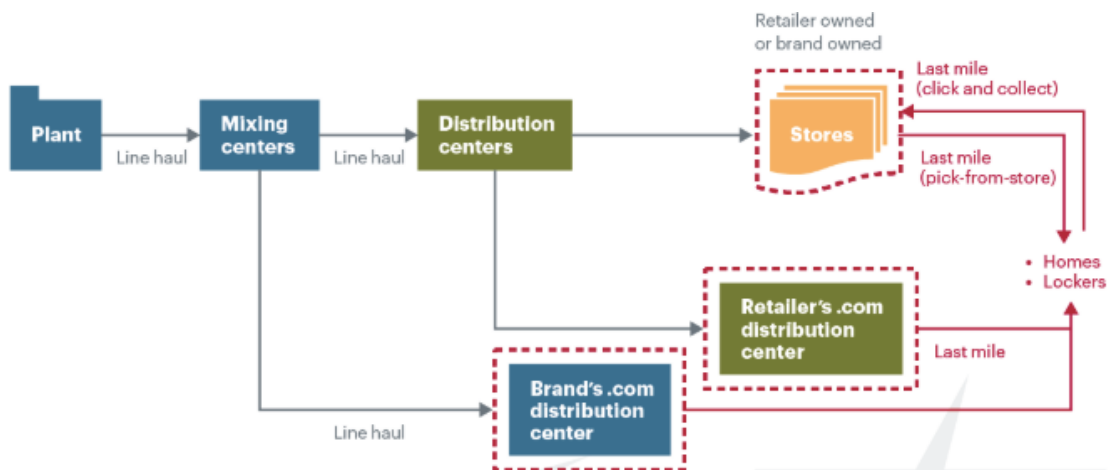

Figure 1: The structure of last-mile logistics (sourced by ATKearney 2017.)

In Figure 1, the main stages of the B2C supply chain are characterized as follows: Finished products are delivered from a producer to distribution centers (DC). The next stages of the goods's movement to the final customers are organized in different ways:

- Products can be shipped to either regional brand-owned or retailer-owned stores. At designated local stores, the products would be collected by the brand's own customers via the "click and collect" model.

- Products can be shipped to pick-up points within customer proximity. The pick-up points can be convenience stores or lockers. Customers freely collect "ready-to-pickup" packages in their own traveling time.

- Products can be directly transported to the customer locations.

In Deloitte Insights, a breakdown of the last-mile is "where large shipments of goods atomize into hundreds or thousands of individual deliveries, each with its own route, location and timing. (Choe, Rosenberger, Garza & Woolfolk 2017.)

The emergence of the "last-mile" service receives attention from the retail business in the association with the end customer. Moreover, the proliferation of internet retailing requires direct delivery to the customer's address. This service not only delivers the physical product but also offers the customer a seamless experience provided by the vendors. In Supply Chain Dive, DeJianne, the UPS' director of marketing in consumer goods, apparel and retail sector states: "The final mile delivery when it comes to end consumer delivery is really supplying that end consumer with the experience that they are looking for" (Lopez, 2017). Hence, the focus of last-mile logistics is the agility and flexibility in reaching the end-user.

The extent of the operation mainly works in urban areas or growing cities where residents have a high demand for personalized and customized deliveries. Indications point out that the last-mile is the most expensive step of the logistics process (Harrington 2015). Due to inefficiencies, the issue adds up substantial financial losses to both the retailers and logistics providers.

Classification of Last-mile Distribution System

The process of the last-mile delivery is well-performed by the cooperation of stakeholders including manufacturers, retailers, logistics providers, and customers. To keep up with high customer expectations, distribution strategies are classified into three different systems: Push-centric, pull-centric and hybrid systems as seen in Figure 2. (Lim, Jin and Srai 2017.)
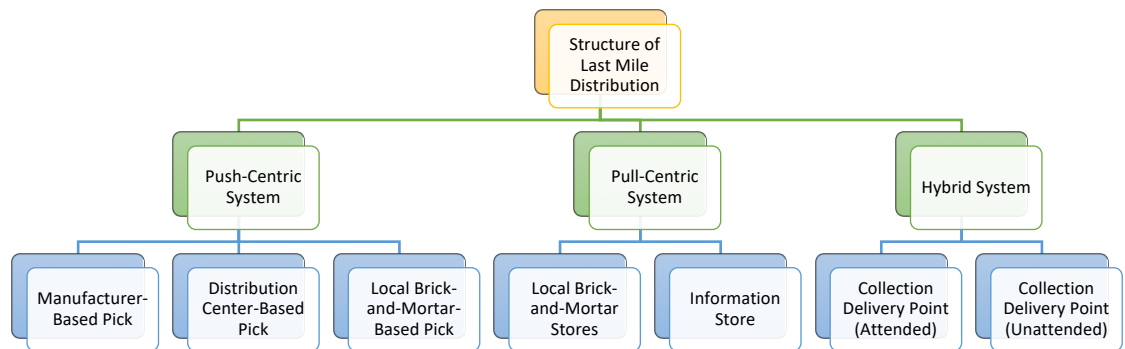
Figure 2: The structure of last-mile distribution

Push-centric system: The function is characterized by direct delivery to the customer location from the merchant. Picking of push-centric distribution refers to manufacturer-based, DC-based and local brick-and-mortar (B&M) based facilities. (Lim 2017). Consumer delivery is provided by either the company's own fleets or their logistics providers.

Pull-centric system: There are two modes of pull configuration: local B&M stores and information stores. Both types require individual customers handling the whole transaction and delivery. The first type refers to the collection of physical products undertaken by customers via the "click and collect" shipping option. Customers can come to predetermined locations to pick up their packages on their daily trips. (Wang, Zhan, Ruan & Zhang 2014). The second type, the information store, is known as dematerialization when a service is purchased and delivered in digital forms (software, publications, music). The replacement of information flow is visible due to no inventory, fast delivery and no shipping cost. (Lee & Whang 2001.)

Hybrid system: The combination of push and pull configuration when both the vendor and the customer undertake a part function of the distribution. The combined system is divided into two different types of collection delivery point (CDP): attended CDP (CDP-A) and unattended CDP (CDP-U).

Attended home delivery (CDP-A): The model refers to a direct contact between the customer and the shipper. It requires both parties available at the point of reception

at the assigned time to accept a shipment. The concept is the most preferred delivery option in the e-commerce segment. However, it results in complexity caused by the requirement of the customer's presence at home home and vehicle routing effectiveness.

Unattended home delivery (CDP-U): The model allows shipments to be delivered, irrespective of customer availability. The package is placed in customer locations ranging from lockers or centralized pick-up points, and it is collected by the customer. The strategy mitigates the "not-at-home" risk and delivery expenses. (Hübner, Kuhn & Wollenburg 2016; Lim 2017.)

Challenges of Last-mile Delivery

Last-mile delivery is considered a bottleneck of the supply chain, as the process is the most expensive and time-sensitive. The rise of internet retailing directly impacts on the last-mile delivery due to an exponential volume of online orders and customized services. In order to enhance the perceived value of products, entrepreneurs enthusiastically promote multiple of attractive shipping options for instant gratification. The expenditure for the last-mile delivery is substantial. A study by Honeywell reported that the last mile accounted for the highest portion of total logistics expenses by 53% in 2016 (Figure 3). The final frontier faces a set of main challenges as follows:

Share Of Delivery Costs, By Part Of Journey

■ Last-mile delivery   ■ Line haul   ■ Sorting   ■ Collection

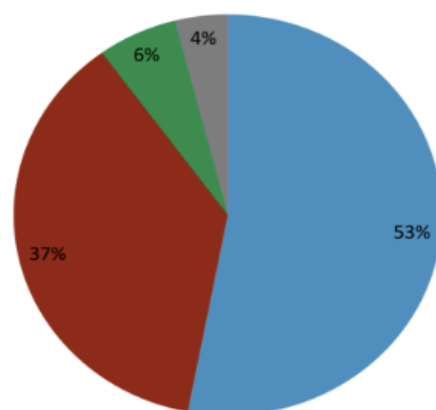

Figure 3: The share of delivery cost (sourced by Honeywell 2016.)

Utilization of Transportation Modes

In delivery, the cheapest mode of transportation and a full load translate into low freight costs. However, parcel and on-demand services heavily pressure on frequent and quick deliveries. Hence, smaller vehicles are involved, namely vans or scooters. Frequent vehicle movements with load inefficiency significantly contribute to elevating overhead costs. Additionally, route uncertainty generates a higher chance of cost added. Residential delivery requires numerous stops with low drop-off volume on a route. A sufficient fleet of vehicles, fuel, and labor costs are involved in spending per route in everyday delivery. Brad Bradley, an enterprise account manager of Descartes, states "A one or two delivery drop off can be more expensive than five to ten deliveries logistically planned". (Hochfelder 2017.)

Unpredictability of Customers

Merchants and carriers encounter a high risk of cost-associated uncertainty in terms of customer nuances. Customer unavailability, incorrect address, and "cannot-navigate" locations are unpredictable issues which result in a high chance of failed or late deliveries. It raises an additional attempt of re-delivery since a shipment does not arrive at the recipient. In every 20 online orders, there is one delivery order failed on the first attempt. The shipment returns cause vehicle empty vehicle runs without fulfillment. It increases handling costs with additional days of re-fulfillment time and revisits. Each fault move charges an average cost of $17.78. The total of failed delivery expenses was valued at $199,127 in three surveyed market nations: the US, the UK, and Germany in 2017 (PCA Predict, 2017). Delivery faults not only hurt a company's bottom line, but also threatens the customer relationship.

Growing Customer Expectations

When consumers prefer online purchase to "in-store" shopping, the availability of diverse shipping options is expected to meet the current consumer demands. However, consumer preferences are increasingly complicated. In order to gain instant gratification, retailers carry operating expenses for consumers seamless and flexible options, including faster deliveries, affordable shipping fees, and narrow delivery time slots.

Faster deliveries: Speed of delivery is the most widely criterion for customers' purchase considerations in e-commerce. E-commerce merchants are ever-fiercely competitive to follow the Amazon effect of the same-day or even two-hour delivery. Stephenie Landry, Amazon's Prime Now Head says: "10 years ago, people thought two-day shipping seemed really fast, now we think two-hour shipping and one-hour shipping will be the standard" (Ivonye 2017). There is no doubt that customers expect comparable delivery speeds from the brands. The Future of Retail (2018) pointed out that the same-day delivery was preferred by 42% of the consumers surveyed, followed by the next-day delivery with 40%. A study by Accenture showed that 66% of the US respondents expected to be offered one-hour shipping in the urban areas. Customers' decisions are no longer affected by legacy brands. 27% of cyber shoppers are likely to cancel their order cart due to the unavailability of same-day service. Hence, e-retailers and carriers have aggressively released the shortest delivery time as possible. A faster lead-time becomes a significant challenge for meeting customer demands when trying to retain profitability in the last-mile performance. (Accenture 2018.)

Affordable shipping fees: Studies have shown that customers opt to pay a premium for the express delivery. However, the express shipping fee should stand at an affordable rate in a range of customers' budget acceptance. 81% of the buyers abandon their cart due to a high shipping charge. They are likely to look for a substitute if the shipping fee exceeds their budget. They are willing to pay no more than a $5 limit for the same-day packaged delivery. In contrast, variable costs per run range from $7-$10 on average. Therefore, retailers suffer pressure on incremental costs added to subsidizing the actual delivery costs with that the the cost customers pay. Most companies are shouldered with 25% of the delivery cost for the compensation. (Accenture 2018.)

Narrow delivery time slots: In the context of convenience and customization, the "time window" strategy allows customers to choose a specific delivery time frame which fits their schedule. A shipment is then delivered to the recipient at the allocated window of time. Businesses tend to tighten these timeslots. For example, a four-hour window or even a one-hour slot. High adoption of a tight timeframe

greatly results in a great complexity of delivery routing design because a vehicle distributes shipments with different zip codes in a single time slot, and it cannot optimize the shortest distance. The tight schedule causes travel time uncertainties and on-time delivery problems due to the demand fluctuation. It drives up total delivery costs. (Agatz, Campbell, Fleischmann & Savelsbergh 2010.)

Environmental Impacts

Besides cost-related efficiency, last-mile sustainability is a highly disputed topic. It contributes to a remarkable impact on the environment. Sustainable transportation is restricted by a promise of timely freight transport. The stress of faster deliveries and no consolidation drastically expand carbon emissions. Additionally, empty runs from returns and new delivery attempts produce extra carbon dioxide. Furthermore, the dedicated circulation of delivery vehicles creates traffic congestion and noise pollution in high-density urban areas. They highly influence on the size of the carbon footprint. Alan McKinnon, a professor of logistics at Kuhne Logistics University analyzed an average home delivery handling 120 stops per an 80 km-journey. It emits 20kg of carbon dioxide or 170g per single delivery. (Pearce 2019.)

2.2   Crowdsourced Delivery

Definition of Crowdsourcing

The term of crowdsourcing was initially named by Jeff Howe in 2006. It is defined as "the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call". The term is under the umbrella of the "sharing economy". (Howe 2006.)

Crowdsourcing is compounded of "crowd" and "outsourcing". Hence, crowdsourcing is a joint process in which services and ideas are attained by a group of individuals outside an organization rather than in-house specialists. The network is supported by the Internet-based technologies in mass collaboration. It links individuals from varied backgrounds, qualifications, and talents all over the world by using online platforms for completing the task. The crowd helps various challenges of "complexity and modularity" from "simple tasks (image labeling, voting) to complex works (new product

design or strategic planning)" (Deloitte 2016). Thus, the crowd plays a role that "exceeds even that of the biggest and most complex global corporation, bringing in many more individuals to focus on a given challenge" (Deloitte 2016). The major implication of crowdsourcing is the distribution of problem-solving and adaptability. An organization leverages a voluntary community to operate an efficient performance. The technology increases the scale of production and reduces labor expenses and capital costs. (Brabham 2013; Deloitte 2016; Surowiecki 2005.)

Crowdsourcing has become an economic phenomenon. It reorganizes the structure of the outsourcing setting in various industries. The combination gradually blurs the line of traditional corporation arrangements. It diminishes the involvement of intermediaries in business, which makes economic transactions more complex and costly by financial obligations. (Martucci 2014.)

This method is a relationship between an enterprise and individuals with mutual benefits. Effectively shared inputs of an online community help an enterprise develop creative production and enhance its core competencies in cost-effectiveness.Furthermore, the technology creates more working opportunities and produces incentives in return for individuals, especially freelancers. In the USA, 34% of the surveyed workforce worked in freelancing in 2014. (Zimmerman 2016.)

The crowdsourcing outcomes attract enterprises to apply this model as an alternative. Successful fields in the spectrum include the fields of the transportation, the hospitality and food & beverages. The most successful practitioners are Airbnb and Uber. Both technology-oriented companies operate the online marketplaces that provide business transactions at reasonable prices. Airbnb is an application of short-term rentals in the sector of hotel and hospitality. Registered hosts provide their real estate for rent and customers can have a short-term stay at a more affordable price than hotels. Uber has revolutionized in the transportation industry. The company's ride-hailing application enables to pair available drivers with passengers. Uber's drivers leverage their idle driving time to gain monetary rewards. The passengers save more money than by using the traditional taxi brands.

Crowdsourced Delivery

Customer expectations for on-demand delivery are escalating. There is no sign of a slow-down. Instant delivery is becoming a normal progression. In contrast, personalized offerings raise the premium overhead delivery expenses. The crowdsourced delivery is successfully applied to the food takeaway market such as Food Panda and Uber Eats. Hence, the packaged delivery is no exception. This phenomenon is a game-changer in the last-mile delivery. It can solve the current challenges to handle flexibility and scalability. A study by DHL reported that nearly half of the US customers (41%) used crowdsourcing for the on-demand delivery services in 2017. In a new global study, 90% of the retailers expected to utilize the disruptive model in certain tasks by 2028 (Metzker 2019). A breakdown of the crowdsourced delivery is presented as follows:

Crowdsourced delivery is defined as an innovative peer-to-peer shipping method of the last-mile fulfillment. It is conducted by app-based platforms. The term is also known as crowd shipping. Individuals are involved in delivering the package to the final customer instead of traditional carriers. Ordinary drivers "carpool" the parcel at the nearby pick-up and deliver it to the designated destination by their routes. They are willing to make a minimal detour in their existing route for delivery. The motivation of a detour is to gain monetary remuneration in return after the service is done. (Paloheimo, Lettenmeier& Waris 2015.)

The new model represents the social transition from ownership to asset sharing (DHL Trend Research 2017). It represents the willingness of individuals to spare their vehicle capacity and free time. The adoption of crowd shipping changes the traditional logistics schemes from a company with heavy owned assets (vehicles and workers) to outsourcing logistics operations to third-party providers. Given under-utilized vehicle assets, the phenomenon helps retailers to streamline faster deliveries at affordable costs without capital-intensiveness. The implication of crowd shipping is "outsourcing" logistics services to mass collaboration. It not only increases capacity utilization, but also reduces operating costs by asset sharing. Therefore, the crowd shipping is a potential solution to the multi-dimensional problems in the complexity of the last-mile system (Gdowska, Viana & Pedroso 2018)

The crowd-based alternative is supported by five main stakeholders: senders, shippers, receivers, platform providers and logistics providers. These stakeholders play

their distinct roles and incentive achievements. Thanks to internet-connected devices, stakeholders easily integrate altogether in the on-progress order.

Senders: A retailing business sells its products via an online platform. Senders are pure online retailers, omnichannel retailers.

Crowd: individuals are willing to serve deliveries as an independent carrier. The crowd is classified into three categories: sub-contractors, professional drivers and casual drivers. Sub-contractors who are employed by legacy logistics companies, for example, DHL, UPS, or FedEx. Professional drivers are employed by traditional couriers. They have free time in their jobs, utilize a free vehicle capacity for delivery. Casual drivers include university students, freelancers or retirees. (Botsman 2014; DB Schenker 2015.)

Receivers: Customers have online purchases and wait for delivery arrivals to their locations.

Platform providers/ application developers who manage the crowdsourcing platforms. The platform company enables to build a seamless integration in the cycle of retailers, shippers, and customers.

Logistics providers: Third-party logistics providers are involved in case of a voluntary driver shortage . Although the mass of individuals is a core of the concept, a professional carrier is employed as a complement. Third-party involvement ensures no interruption in the logistical process. (Milosevic 2018.)

The operation of crowdsourced delivery is represented. A retailer utilizes the crowdsourced delivery platform to seek an order pick-up in a network of nearby drivers available. The first driver secures the task by an order pick-up confirmation. The approved driver then picks up from the sender. The item is transported to the allocated address by the driver's own vehicle and route. The driver will gain a reward when the delivery order is completed and confirmed by the recipient. A driver rating is done by the customer. (Business Insider Intelligence 2019.)

The disruptive technology allows entrepreneurs to use shared assets without ownership. Regarding physical assets, private-owned vehicles are unlimited in the

crowdsourced platforms, namely cars, motorbikes, and bicycles (Figure 4). In contrary to conventional shipping services, crowdsourcing services currently have limited geographic coverage. They mostly deliver in the high-density urban areas where a flow of individual vehicles is high. Hence, the highly geographical distribution has a match with potential city workers. The model leverages city dwellers and workers for delivery. On the other hand, suburban areas find a shortage of drivers for freight mobility. (Business Insider Intelligence 2019.)
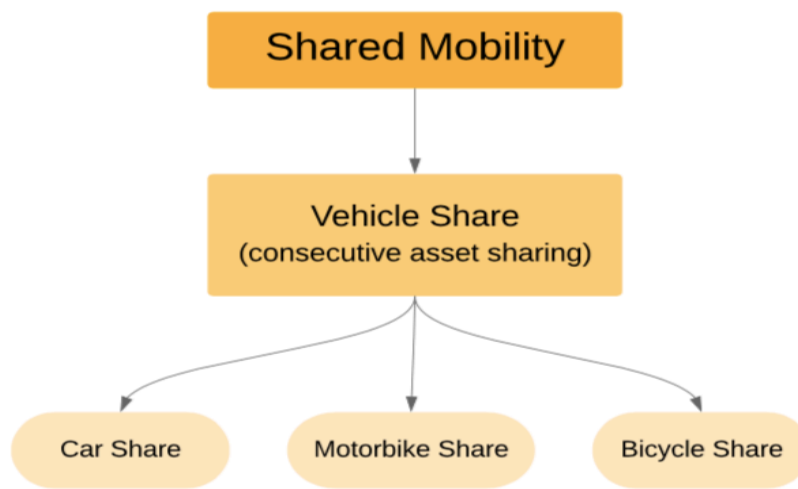
Figure 4: Common modes of asset-sharing in crowd shipping.

Examples of Crowdsourced Delivery

Global retailing giants have eyed on the Uber-style model to improve the last-mile efficiency. They have started to invest in crowdsourced delivery. As a pioneer of this disruptive model, Amazon introduced Amazon Flex in September 2015. The application was designed to enable Prime Now- premium one-day and two-day shipping commitments. The pilot allows individuals to make deliveries to end customers (Dolan 2018). DHL also undertook the same trial platform called MyWays in Stockholm, Sweden in 2013. DHL leveraged the crowdsourcing model for the last-mile delivery from its collection points. (DHL press 2013.)

In 2017, Wall-Mart released a crowdsourcing pilot. Wallmart utilizes its employees for parcel deliveries. Walmart's employees deliver parcels on the way to home.

Apart from above giants by their own platforms, Target and UPS partnered with crowdsourcing startups, including Deliv, Postmates, and Instcart. Deliv's platform covers over 4,000 brands in 35 US's markets. Macy's, Best Buy, Wallmart, and IBM are its giant partners (Dolan 2018; Starcke 2018). Crowdsourced delivery startups have rapidly developed. They have substantial investments in an expansion of the potential industry. London-based Deliveroo received the highest investment funding with nearly $860 million, followed by Instacart with $675 million in Figure 5.

Funding Raised To Date By Various Crowdsourced Delivery Startups
Global, millions ($)

$859	$675	$450	$278	$187	$52	$40
Deliveroo	Instacart	New Dada	Postmates	DoorDash	Fetchr	Deliv
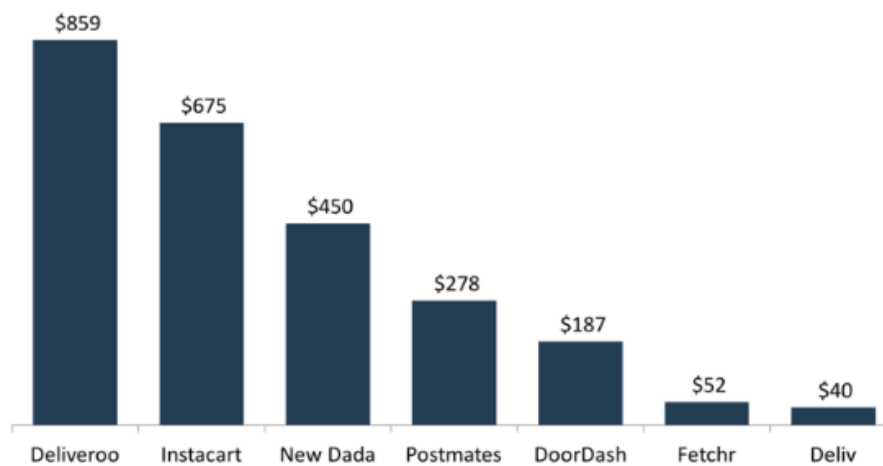
Figure 5: Funding raised by crowd shipping (sourced by Crunchbase 2017.)

Advantages of Crowdsourced Delivery

The strategic crowd-based concept revolutionizes the final mile. It resolves bottlenecks of on-demand services in comparison with the traditional transport. These benefits are addressed including speed, cost, transparency, and environmental perspectives. The win-win solution benefits two parties: enterprises and consumers.

Speed

To customers: Due to a shared route, each individual handles a single parcel assignment on average. The independent driver concentrates to deliver to the designated location. Therefore, customers can get their orders faster- even in an hour.

To enterprises: In on-demand services, speed is a competitive differentiator. It not only optimizes seamless customer experiences, but also streamlines delivery operations

Cost-effectiveness

To customers: The new model offers on-demand shipping at lower prices than legacy express couriers due to shared routes. The model changes cost structures of expedited shipping. In the gig economy, the shipping fee for same-day delivery is a relatively similar price as the two-three day standard shipping by dedicated carriers (DB Schenker 2015).

To enterprises: The practice is economically viable. Retailers can reduce cost-intensive burdens from conventional solutions. Firstly, the asset-light infrastructure underpins the crowdsourced delivery alternative. Companies do not pay fleet management (the cost of vehicle ownership, maintenance per delivery basis) and fuel costs. Hence, it compensates high operating costs from the same-day offering. It also leverages business scalability in low investment requirements. (Dolan 2018.)

Regarding labor costs, market rates of independent carriers are lower than those of professional carriers. A pay for occasional drivers is based on distance. Moreover, paid time is counted a period from a task confirmed to an order completed. In contrast, contracted drivers are typically paid based on either their shifts or times of delivery in a day. In the US, shared drivers get paid an average of $18- $25 per hour. These rates are lower than the average hourly pay of professional drivers: $22 (UPS-delivery company). Besides the fixed pay, allowances are added to their income. (Dolan 2018; Gdowska, Viana & Pedroso 2018.)

Transparency and Traceability

To customers: A crowdsourcing platform maximizes personalized delivery experiences for customers. Firstly, full traceability is the most desired criterion when it comes to online deliveries. 90% of online buyers tracked the status of order delivery (Accenture 2018). The crowdsourcing system facilitates customers to have greater control over the whole process of delivery by geolocation. The process of delivery is fully integrated visibility by GPS. It is connected with the driver's mobile device. It

keeps customers well-informed by automatic notifications such as delivery mile-stones, details of vehicle and a driver. Moreover, customers can choose a convenient time window and even rescheduling. The full route tracking eliminates the possibility of delivery failures. Secondly, transparent pricing is shown to customers. It increases customer trust in digital shopping platforms. (Dolan 2018.)

To enterprises: Retailers have full visibility of the last mile process from the crowd-based model. Once the assigned driver confirms to pick-up an order. The platform starts to track live vehicle location and monitor until the driver arrives at a store. Hence, senders can utilize time to prepare and dispatch the order. Thus, idle time is reduced (Wallmart Labs 2018). Additionally, the information of a driver is constantly updated on the app in regards to availability, ratings and customer reviews. The retailer can evaluate the service performance of gig drivers and improve quality service as well.

Environmental Perspective

High freight movements are in line with a high impact on the environment. Therefore, crowd shipping proves to mitigate environmental externalities through optimization of public vehicle utilization. An experiment in Rome showed that emissions could be declined in annual by using the crowd shipping. In details, "emissions of particular matter (0.3 tons), nitrogen dioxide (4 tons), carbon monoxide (2 tons) and carbon dioxide (1098 tons)". (Trimis 2019.)

Disadvantages of Crowdsourced Delivery

Besides benefits, inherent challenges of crowdsourcing model are identified. The model may face issues, including uncertainty of crowd supply, privacy and safety concerns, workforce protection and capacity limit.

Uncertainty of Crowd Supply

The concept of the crowd-based logistics is that the service is built by temporarily voluntary drivers. There is a rarely strict employment contract bonded between a company and the crowd. Delivery capacity is the main challenge for companies. Managers have to consider how effectively the use of mass collaboration matches the fluctuation of order demands. The availability of independent drivers is uncertain as

opposed to the fleet of dedicated drivers. Dispatch of an order is a fact-based decision rather than an estimation-based decision due to the stochastic supply. If inadequate occasional drivers are localized at a specific time for delivery, operators will make a fast delivery decision. The uncertainty affects the effectiveness of fleet management, which results in low reliability of service quality. (Dolan 2018.)

Price-sensitivity of the temporary workforce is highly concerned as the willingness to make a delivery. The higher the monetary incentive, the more the occasional drivers. In order to ensure the availability of crowd capacity, surge pricing strategy is applied at a higher price than the average level. It attracts the acceptance of crowd sharing in either peak seasons or geographical areas. Low compensation appears fewer motivations for delivery services. It brings a negative impact on the effectiveness of last-mile performance. (Castillo, Bell, Rose & Rodrigues 2017.)

Privacy and Safety Concerns

Privacy is the most sensitive topic of the crowd shipping. Increasing transparency is proportional to a higher chance of personal information release. Attackers may access details of users, for instance: home address and details of a bank account. They may take advantage of sensitive information for criminal purposes. Potential breaches of personal identity threaten the privacy and security for users. (Srivastava & Mostafavi 2018.)

Workforce Protection

Employment rights are considered when it comes to gig workers. Labor rights for gig workers are limited under laws. As a contracted employee, individual benefits from employees' rights such as a basic wage, allowances, unemployment benefits and work insurance. However, none of the employment protections are guaranteed for independent drivers. Gig workers are working at crowd-based jobs on a full-time basis. Therefore, low earnings and limited labor rights threaten their livings. However, policymakers are struggling to provide working benefits to gig workforce, due to the complexity of employee status. The relationship of employee and employer is still hardly identified if a gig worker is either an employee or an independent contractor. (Gdowska, Viana & Pedroso 2018; Reeber 2018.)

Capacity Limit

In crowdsourced delivery, parcels are delivered by varied individual-owned vehicles. These vehicles are unprepared for freight transport with an inadequate storage. Sizes of goods should be sufficient to easily fit in the trunk of a car or a scooter. For the convenience of independent drivers, shipments are classified based on size rather than weight. A parcel-sized shipment is the most preferable for crowd-based transport ranging between small and medium volume. Moreover, a number of shipments that occasional drivers deliver are limited. (Taniguchi & Thompson 2018.)

2.3   The Landscape of Last-mile Delivery in Vietnam

The Outlook of E-commerce in Vietnam

Vietnam is a fast-developing nation when it comes to B2C e-commerce field. It is expected to gain 32.3% of the compounded annual growth rate (CAGR) between 2018 and 2022 (EU-Vietnam Business Network, 2018). A study by Statista (2018) stated that Vietnam ranked the world' sixth largest revenue in e-commerce market with $2.27 billion in the total revenue, increase by 29.4% on the year. In Frost & Sullivan, Vietnam's e-commerce market size was predicted to hit US$ 3.7 billion in 2030. The proportion indicated a 2.9% increase in 2012- 2017. It was estimated to gain 5% of the total retail sales, representing 10 US$ billion in 2020 (see figure 6).

There are three main e-commerce models in Vietnam: Business-to-Business (B2B), Business-to-Consumer (B2C) and Consumer-to-Consumer (C2C).
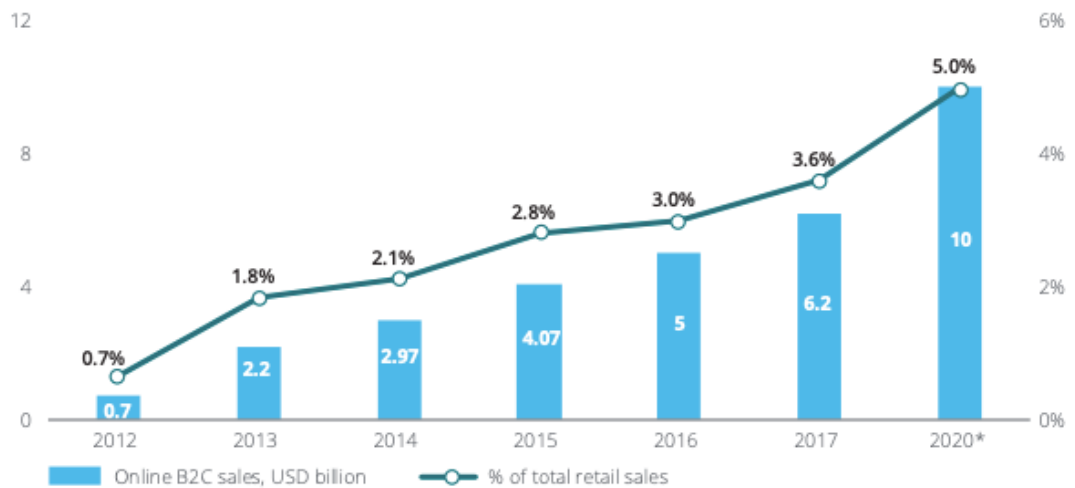
Figure 6: Online B2C sales in Vietnam (sourced by Deloitte 2019.)

The remarkable e-commerce growth reshapes Vietnam's consumer market from two main reasons as follows:

The Explosive Rise of Internet Adoption and Smartphone Ownership

A statistics from Statista reported that 67% of Vietnamese used the internet in 2018. The internet penetration rate is expected to reach 78% in 2023. Moreover, Vietnam ranked the highest growing mobile traffic in 2018 with 73% of the Vietnamese population in smartphone ownership. Vietnam added 79 thousand mobile users in annual. Moreover, 72% of online orders were accessed via mobile apps. (Fintechnews Vietnam 2018.)

A High Population of a Tech-savvy Group

The young, tech-savvy population are attributed to the mobile shopping growth in Vietnam. Vietnam's e-commerce demographics showed a group of millennials was the biggest share in the online shopping preference by 35% of the population in 2018. Generation Z (age group of 1994 to 2002) consumers also contributed to the e-commerce growth. 40% of the population was under 25 years old. They preferred online shopping for convenience, time-saving to shopping in outlets. (Nielsen, 2018).

Massive Investments into E-commerce Market

Vietnam has become the most attractive e-commerce market for both domestic and foreign investors. Charles Brewer, CEO of the DHL eCommerce Vietnam, remarked that "Vietnam remains an exciting market with for us with immense potential" (DHL

Press 2018). The nation witnesses millions of dollars of foreign investments into the e-commerce. The remarkable investments stimulate competitive battles of the e-commerce in adding greater values and enhancing customer experiences.

Tiki Vietnam: JD.com, China's second largest online retailing company invested $44 million in 2018. Tiki also received $5.3 million from VNG Corporation.

Lazada Vietnam: Lazada received the funding valued US$ 249 million from Temasek Holdings in 2014. Alibaba, China's biggest e-commerce giant, invested an additional investment of $2 billion worth in 2017.

Sendo: Series B funding of eight investors injected $51 million, led by Japan's SBI Holdings.

Shoppee Vietnam: Singapore's Sea Group poured $50 million into this firm.

Last-mile Delivery in Vietnam's E-commerce

In research of last-mile trends, Vietnam's last mile was valued at $3.02 billion in 2018. It was forecasted a 10.2% increase in CAGR in a period of 2019 and 2024, reaching $4.89 billion in 2024.

Vietnam's digital retail market is a fiercely competitive battle. E-commerce players consciously evaluate the home delivery as a key differentiator to influence customer perceptions. Thus, massive investments are poured into this segment. Lazada, the first e-retailer has its own logistics operation in Vietnam. It concentrates on investing in automated sorting facilities. Moreover, logistics providers are attempting to approach customer locations closer by network expansion. Giao Hang Nhanh, a domestic logistics provider placed a target of 1,500 outlets in 2018. DHL e-commerce planned to open 1,000 outlets nationwide in late 2019 (EVBN 2018).

Challenges of Last-mile Delivery in Vietnam

In spite of potentials, Vietnam witnesses a big gap for high-quality logistics and cost efficiency due to current hurdles. Challenges of last-mile in Vietnam encompass the urban problems, the undeveloped infrastructures, and the COD payment.

Urban Problems

The transport limitations inevitably raise higher expenses on inefficient routes, time lags, and fuel wastes. The frequently-jammed traffic and poor road infrastructure are two main restrictions in Vietnam.

Road congestions: Traffic jams in Vietnam are unavoidable due to rapid urbanization. Rising traveling demands in cities are in line with the hike of urbanization. The existing road capacities of connectivity networks are overloaded with actual urban demands. Ho Chi Minh City and Hanoi are the two main hubs in Vietnam. They are well known as the heaviest jammed towns in Vietnam. Urban areas are more stressful with the majority of passenger travels and freight movements every day. Vehicles are stuck by traffic jams for an average of over an hour. Hot spots in rush hours are much worse. Freight vehicles, which unavoidably get caught by congestions, potentially miss on-time deliveries. Amanda Rasmussen, a chief operating officer at Indo Trans Logistics, reported that 500,000 e-commerce orders were placed every day. The e-shopping activity is mainly dynamic in Ho Chi Minh and Hanoi by 75%. A 2000 km-apart connectivity contributes more strains on transportation due to the chronic congestions. (Whelan 2018.)

Poor road infrastructure: Vietnam's last-mile logistics has been suffering from poor transport networks. Vietnam's road infrastructure in cities is underdeveloped and badly-maintained. However, construction of flyovers and expansions are aimed to alleviate traffic volumes in the main dense areas, current improvements for road capacity are insufficient to the urban demands. An investigation by World Economic Forum demonstrated the national infrastructure was under substantial development. Vietnam's quality of overall infrastructure ranked 89th of 137 analyzed nations. It also placed at 92nd in the quality of roads (World Economic Forum 2017). Thinh Vu, a manager at Lazada Express Vietnam, disclosed that the fastest delivery between the two hubs takes 48 hours by truck due to the traffic difficulties (Whelan 2018). Moreover, narrow sized and unplanned streets make difficulty for a shipper in navigating a customer location. It also challenges a small van to access a customer's house located in a tiny alley.

Undeveloped Logistics Infrastructure

Despite the thrive of Vietnam's e-commerce market, technological-driven infrastructure is developing at a slow pace. Entrepreneurs in Vietnam possess a lack of high-tech advancements throughout their logistical operations. Low technologies heavily impact on profitability.

Limited traceability and visibility: A better visibility of shipments is promised to perform in Vietnam's e-commerce. However, online shoppers continuously complain that tracking details are not regularly updated. Next, no notifications are communicated by electronic pre-delivery alerts ahead of actual arrivals. Therefore, recipients are unprepared for receiving in that time range. In most cases, a shipper only calls a customer to receive shipment when he stands in front of the customer location. Consequently, the likelihood of "not-at-home" status exponentially grows. Online shopping is supposed to deliver consumers the convenience and the flexibility. In contrast, poor details of delivery traceability cause customer frustration.

A shortage of collection points: Drop-off points are limited in Vietnam. A convenience stores , which is the most ideal collection place, has no collaboration with any logistics carriers. That place is also not designed for parcel storage. A fact that logistics companies are expanding their network of distribution by opening their outlets nationwide. However, the private outlets result in customer inconvenience for pick-up. Because they have to arrive different points by different courier ownerships, all shipment delivered to a one point instead.

The possibility of automated pick-up points is questionable in Vietnam. Firstly, the solution is required the prime real estate, the power, and the internet connection. A high volume of self-service lockers is required to scatter in the metropolitan areas (Ho Chi Minh city, Hanoi). The investment of the locker system varies from $5000 to $35000 per machine in installation and maintenance. Due to the huge investments, retailers may hesitate to execute the self-service strategy in practice. In LMFAsia (2017), Lazada Vietnam reported: "these lockers are more expensive than couriers that can take the package directly to the door". (Luo 2017.)

Cash-on-Delivery Payment Method

The Cash-on-Delivery (COD) is the Vietnam's most preferred payment method. The vast majority of shoppers (88 %) opted to use the primary cash transaction in e-

commerce. Nevertheless, Vietnamese consumers who owned bank accounts, they continuously preferred to pay by cash when they received items on hand, representing 42%. Appota reported that 46% of the Vietnamese consumers did not use the digital payment due to no bank account in 2017. They are not interested in the mobile payment alternative when cash is popular and easy to use. Furthermore, Vietnamese customers do not trust in online trading and fear of online fraud.

In the deep-rooted cash community, shippers make an extra step to collect the cash payment from consumers. It causes a monetary circulation back at a slow pace. Lazada Group reported that the COD charges e-commerce higher than other payment methods. The popularity of the COD drives the likelihood of empty vehicle runs when customers do not have sufficient cash for order payments. It increases unexpected costs because orders must be sent back to the sellers.

2.4   Perceived Attributes Influence on the Rate of Innovation Adoption

In order to deploy the crowdsourcing system in the distribution chain, the innovation adoption process is implemented. The rate of adoption is defined as "the relative speed with which an innovation is adopted by members of a social system" (Roger 1983). Individuals evaluate product-based criteria in association with their purchase behaviors. It is a decision-making process that customers either accept or reject the product diffusion. Roger determines five fundamental factors in the innovation adoption. These attributes encompass relative advantage, compatibility, complexity, trialability, and observability. Roger states that these perceived attributes play the key pillars in the customer intention towards a possible acceptance. It makes up "49 to 87% of the variance in the rate of adoption" (Roger 1983). Apart from Roger's innovation attributes, a factor of "perceived risks" plays an important role in the effect of future purchase from customers' perspectives. (Maciejewski 2011; Savas 2017; Tanakinjal, Deans & Gray 2010.)

The process is tested to identify how perceived attributes influence the behavioral intention towards the proposed product. In the temporal construal theory, these characteristics are impacted by "temporally distinct decisions" (Trope & Liberman 2003). It explains that adopters evaluate product-based features differently,

depending on a distinct point in time. If customer behaviors are distant in time, the adoption intentions are more likely to get influenced by "relative abstract or general considerations". If their behaviors are close in time, the adoption purposes are more likely to get influenced by "concrete, specific and context-dependent characteristics" (Trope & Liberman 2003). Each perceived characteristic is shown as below:

Relative advantage (RA)

Relative advantage refers to "the degree to which an innovation is perceived as being better than the idea it supersedes" (Roger 1983). It reflects the benefits of the product provided to adopters over existing offerings. The product-related advantages range from product advancements, prices to means of product availability. The attribute facilitates a high chance of the adoption rate in the target market. (Roger 1983.)

In the context of the study, crowdsourced logistics is perceived to be more beneficial than standard shipping offerings. Advantages of crowdsourcing system deliver customers distinct values, namely performance values (the prompt delivery- two or four-hour shipping and the live tracking of a shipment), economical values (more reasonable shipping charges), and service interaction patterns (push notifications and pre-calls before delivery). These features are met current customer demands of the last-mile transport.

Compatibility (C)

The phrase is described as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Roger 1983). It measures the extent to which the product values match potential customer demands. The closer the product fits customer needs, the lower the rate of perceived uncertainty stands. The attribute increases a chance of adoption rate on the innovation. (Arts, Frambach & Bijmolt 2011.)

To the extent of the study, compatibility describes how the crowdsourcing method fits customer attitudes. The benefits of crowd shipping may match either customers' hectic lifestyle or immediate demands. Furthermore, eco-conscious consumers may like this service.

Complexity (X)

The term refers to "the degree to which an innovation is perceived as relatively difficult to understand and use" (Roger 1983). The negative factor degrades the prospective diffusion. The higher the complexity attribute, the lower the rate of diffusion. Potential adopters resist adopting a new product due to the complexity of use. (Roger 1983.)

In the concept of crowd logistics, complexity may occur when customers interact with the crowdsourcing system by a digital platform. Consumers may consider the use of crowdsourcing system to be difficult-to-access. It shows a negative relation with consumer attitudes towards their behavioral intention.

Perceived Risk (R)

The phrase is defined as the degree to which potential risks are perceived by consumers in association with innovation. Potential risks involved affect consumer purchasing decisions. The determinant comprises of uncertainty and consequences in a purchasing process. The two factors result in "the likelihood of unfavorable outcomes" (unhappiness) and "the importance of losses" (a loss of time, a waste of money) (Cunningham 1967). Therefore, risk identification minimizes their purchase reluctance during the adoption process.

Within the crowd logistics, perceived risks are security and privacy issues. Due to increasing transparency, customers may be afraid of sharing their identity and their address to strangers. They may not trust a deliver man without the company's uniform for safety concerns.

Trialability (T)

The term refers to "the degree to which an innovation may be experimented with on a limited basis" (Roger 1983). It describes that potential adopters easily explore a new product. They run a test, evaluate and then decide to either accept or reject the product. The attribute gives customers a good experience during the trial. As a result, they have confidence to adopt the product. (Meuter, Bitner, Ostrom & Brown 2006; Roger 1983.)

In the study, free trials would be offered to show customers the value of the new product. It is expected that customers may find the pilot to be easy to use and less potential risks. Therefore, it raises a greater behavioral motivation to use the service.

Observability (O)

The term is "the degree to which the results of an innovation are visible to others" (Roger 1983). The product is observed by potential customers. Positive performances shown motivate customers in the chance of product acceptance.

In respect of the crowdsourced logistics, the system can be easily learned from observing other customers. Benefits of easy access are anticipated to gain a greater behavioral intention towards potential use.

3   Methodology

The research applied mixed approaches, which consisted of quantitative and qualitative approaches. The mixed-method research is more beneficial than the mono method. It provides a better understanding of the research problems, strengthens the comprehensiveness and the validity of statistical inference (Creswell 2007). The approach entailed the combination of the individual survey and the semi-structured interview. The survey of customer behaviors was conducted in the form of online anonymity. Subsequently, statistical analyses were employed to examine the hypotheses in the study. The semi-structured method was applied in in-depth interviews with five random customers in the target market. In the interviews that lasted on average for 15 minutes, the respondents shared their opinions about the innovative product via Skype.

The target population in the study was consumers in Vietnam's e-commerce market. Hence, the questionnaire was designed and translated into Vietnamese. Regarding transportation, the concept of crowdsourcing was familiar to the Vietnamese consumers because of the online food delivery and ride-hailing sectors. These online-to-offline services were attractive and adaptive to to the Vietnamese consumption habits. Hence, the questionnaire was reachable and easily understandable for the Viet-

namese respondents. Besides socio-demographic and customer experiences, the respondents were requested to rate the degrees of their agreement, based on the perception of crowd shipping. The items were scored by using the 5-point Likert scale. The levels of measurement ranged from 1= "strongly disagree" to 5= "strongly agree". "Neutral" component was added as 3 for those respondents who neither agree nor disagree.

Out of 121 responses, 115 individuals responded to the survey in total. The questionnaire reached the respondents via the Internet. The collected data were computed by using the SPSS 23 (the Statistical Package for the Social Science) for testing the hypotheses.

The instrument of the research was a questionnaire designed to address the study objectives. It was divided into three main parts: Socio-demographics, online shopping experiences and the perceived characteristics of demand.

Part 1 was designed for collecting the respondents' social demographics, including gender, age, and their occupation. Part 2 focused on respondents' experiences concerning online purchases, namely the frequency of online shopping, product categories, pick-up locations and types of payment. Part 3 covered six main attributes in Roger's Diffusion Theory and intention-to-use which are explained in the section 3.4. The questionnaire was provided in Appendix 1.

Following Roger's theory, the study investigated how the observed variables influenced the customers' intentions toward crowdsourced delivery. Statistical methods were adopted to achieve the objectives of the research. The data analysis involved several steps. Firstly, regarding the high reliability and validity in the questionnaire, internal consistency analysis (Cronbach's alpha) and construct validity through Exploratory factor analysis (EFA) were executed. Correlation analysis was employed to determine the strength of relationship. Last but not least, the rate of innovation diffusion was measured by using the multiple regression analysis.

4   Research Results

4.1   The Survey

In the conceptual framework, six main perceived factors are independent variables. Out of a total of 25 items, 22 elaborated items were measured for each relative construct. A factor "Intention-to-use" was measured as a dependent variable with three items. The questionnaire is shown in Appendix 1. The demand survey investigated the influence of perceived factors on the overall customer intention related to crowd shipping. In order to achieve the study objectives, six main hypotheses were proposed as below:

H1: Relative advantage has a positive significant influence on customers' behavior towards the adoption of crowd shipping.

H2: Compatibility has a positive significant influence on consumers' behavior towards the adoption of crowd shipping.

H3: Complexity has a negative significant influence on customers' behaviors towards the adoption of crowd shipping.

H4: Perceived risk has a negative significant influence on customers' behavior towards the adoption of crowd shipping.

H5: Trialability has a positive significant influence on customers' behavior towards the adoption of crowd shipping.

H6: Observability has a positive significant influence on customers' behavior towards the adoption of crowd shipping.

The results are illustrated below. Firstly, the social demographics of the participants and their online shopping experiences related to delivery are shown. After this, the chapter focuses on the correlations between the perceived attributes and the diffusion of crowd shipping that were investigated by using hypothesis testing.

Descriptive Statistics of the Respondents' Profiles

Social demographics: Out of the 115 respondents, females (70 %) outnumbered males (30 %). Of these, millennials and Gen Z were the two dominating groups in the age distribution. They were the expected target consumers in the study. Over half of the participants (57%) were millennials aged between 23 to 38 years. They constituted the largest share of the total population, and they were followed by Gen Z (37%) aged from 18 to 22 years. Only 6% of the participants were aged over 39 years old. Most of the respondents were students and employees by 46% and 39% respectively.

Online shopping experiences: In the survey, home delivery was the most favorite shipping method in Vietnam's e-commerce market. The vast majority of the respondents (92%) preferred collecting their parcels delivered by face-to-face. Specifically, 64% of the respondents stated that they used home delivery for online purchases. The "Office" was the second preferred pick-up location with 29%. Only 7% of the respondents selected the alternative method of collection points for receiving packages.

As expected, the majority of the Vietnamese participants (67%) relied on paying in cash. On the other hand, one third (33%) of the cyber shoppers opted to use mobile payments. In summary, home delivery and COD were the main Vietnamese customers' preferences on online shopping.

Negative experiences with online shopping: Multiple-choice questions were designed for the problems of last-mile delivery. The findings revealed that "late deliveries" constituted the largest group of the delivery problems by 63 %. The "lack of order updates" was the second customers' complaint in deliveries, which accounted for 51%. The respondents were also unhappy with "not-at home" and poor notifications by 45% and 37% respectively. One-fourth of the Vietnamese respondents selected non-rescheduling as their least delivery problem. Thus, the participants were unlikely to change their pick-up addresses or time during in-transit. In conclusion, late deliveries and no full visibility reflected bad overall experiences of the customers with their online purchase transactions. In other words, the Vietnamese online shoppers had a high demand for fast delivery and real-time traceability.

Knowledge of crowdsourced-based services: Most of the Vietnamese respondents (78%) had a great knowledge of the crowdsourcing models. This was further supported in the responses to the main attributes in the questionnaire. There were Vietnamese respondents who knew this service but never used it, which accounted for 42% in total. Moreover, 36% of the respondents said they knew and used this system with various services, namely with online food deliveries or ride-hailing services. On the other hand, 22% of the respondents did not know this service.

Descriptive Statistics of Innovation Characteristics

The descriptive statistics are illustrated, including the means, standard deviations, the percentage of agreement on the scale of 1 (strongly disagree)- 5(strongly agree). There were six perceived innovation attributes and "intention to use". "Intention to use" gained the highest mean (M=3.97) with the score range of 3 to 5. The results showed that Vietnamese consumers had a positive service attitude on purchase intention, and it was followed by Trialability and Observation with mean of 3.85. Complexity reached the lowest mean (M=2.44). Measurements of the underlying characteristics are illustrated in Appendix 3.

Relative advantages: All proposed items of relative advantages gained high scores in the survey. The results were obvious when respondents saw the crowdsourced bene-fits, including the ultra-fast delivery, the affordable shipping charge, the live tracking, and the proactive alerts. The means ranged from 3.66- 3.87. They expected the ser-vice to improve their delivery experiences. The ultra-fast delivery placed at the top of the agreement rate (M=3.87). Meanwhile, the affordable shipping charge was the least agreement rate (M=3.66). It indicated that Vietnamese respondents doubted the pricing if it would meet their budget. This dimension should be deliberately taken into account to make the adoption viable.

Compatibility: Vietnamese respondents felt high compatibility with crowd shipping with the average means of 3.81. They felt that this service would fit into their hectic life at the highest level (M=3.92). Meanwhile, they felt the least compatible with en-vironmental-friendly aspect (M=3.64).

Complexity and perceived risks are the negative characteristics causing the customer reluctance in innovation acceptance. Complexity has the lowest average score

(M=2.44). The figure explains respondents did not see complexity in their future use of crowd shipping due to the great familiarity of other crowdsourcing services. In terms of perceived risks, Vietnamese respondents were aware of potential risks (M=3.49), including the "personal information-sharing", the "package receiving from a stranger" and online payment. Particularly, 67 % of the respondents rated the agreement sides on "collecting the parcel from a stranger" which gained the highest score (M= 3.71). The figure explains that they worried about safety issues. Meanwhile, they rated the online payment as the least risk (M=3.22).

Trialability and observability gained the same score of 3.85. These figures explain two characteristics have positive effects on customer intention in the future use of crowd shipping.

Customer intention achieved the highest score in all characteristics on average (M=3.97). In details, the respondents were prone to use the service in their next purchase at the highest level (M=4.24). 86% of the respondents agreed and strongly agreed on this dimension. "I will use it as needed" ranked at the second position (M=3.96), followed by "it is my favorite service (M=3.71).

Reliability Analysis (Cronbach's alpha)

The research was designed to analyze the latent variables. Cronbach's alpha was employed to examine the validity of the questionnaires. Cronbach's alpha (α) was developed by Lee Cronbach in 1951. It is defined as "the degree to which all items in the test measure the same construct". The measure should be assessed first to ensure the stability and reliability of the measurement. The higher the level of alpha, the higher correlation between items in the same construct. The acceptable values of alpha ranges of 0.7-0.95. In particular, the alpha coefficient of 0.7 or higher indicates "acceptability", above 0.8 considers "good" and over 0.9 means "excellence". (Tavakoi & Dennick 2011.)

The inter-item reliability calculated the whole scale was 0.832 (Table 1). The figure indicates the internal consistency of the questionnaires was good. In Table 2, all sub-dimensions reached the recommended level of acceptance in the reliability. In details, the alpha of compatibility (0.742), perceived risks (0.776) and intention to use

(0.712) were good. Relative advantages (0.809), complexity (0.852) achieved the alpha of above 0.8, indicating good. Trialability (0.906) and Observation (0.934) reached the highest point of 0.9, indicating excellent. Lastly, good reliability was achieved within the research. The study was eligible to analyze further analyses.

Table 1: Reliability Statistics

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.832	.867	25

Table 2: The summary of reliability statistics

	Cronbach's Alpha	Number of items
RA-Relative advantages	0.809	4
C- Compatibility- C	0.742	3
CX- Complexity	0.852	4
R- Perceived risks	0.776	3
T- Trialability	0.906	4
O- Observation	0.934	4
I- Intention to use	0.712	3

Validity Analysis

In order to verify the validity of the instrument, explanatory factor analysis (EFA) was conducted. EFA is a statistical technique to identify the intercorrelation among the underlying latent variables in a dataset. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was conducted to determine the sampling adequacy within the

questionnaire. It also confirmed that items in the dataset were appropriate for further investigations. The values of KMO ranges from 0.5 to 1. Besides KMO, Bartlett's Test of Sphericity (BTS) was executed to determine if relationships among items were sufficiently large for the EFA approach. In order to test the appropriateness of data, KMO is greater than 0.6 and BTS must be significant at the significance level of below 0.05. (Netemeyer, Bearden & Sharma 2003.)

The EFA approach was conducted. It was extracted and rotated with a varimax rotation by using the SPSS 23 software system. Table 3 indicates that KMO reached 0.834 which was greater than the recommended threshold of 0.6. Afterward, the result of Bartlett's test was significant at a figure of 2448.425, p=0.000 < 0.05. It indicates the data size was sufficiently large to proceed with the factor analysis.

Table 3: KMO and Bartlett's Test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.834
Bartlett's Test of Sphericity	Approx. Chi-Square	2448.425
	df	300
	Sig.	.000

Given the calculated indices from the reliability and validity analyses, it is concluded that the questionnaire model was sufficiently large and acceptable. The relevant variables were found to be highly valid and reliable. Thus, the research was qualified to proceed the further assumption testing.

Correlation Matrix (Pearson Correlation Coefficient)

Pearson product-moment correlation (*r*) is the most common parametric measure in statistics. It is widely known as the Pearson correlation. It aims at identifying the linear relationship between two continuous variables. The range of values *r* is from -1

to 1. The sign of the coefficient represents the direction of the linear relationship. The magnitude of the coefficient shows the strength of the relationship. A value of less than 0 shows a negative association, of more than 0 indicates a positive association. (Rodgers & Nicewander 1988.)

Socio-demographics was tested by the Pearson correlation to measure whether gender, age, and occupation were related to the purchase intention. The results showed no support for the influence of the socio-demographics and the customer intention due to $p > 0.01$.

The relationship between each perceived attributes and the consumers' intention was tested. As shown in Appendix 4, five attributes were correlated with the customer intention, except perceived risks. According to the results, the construct "relative advantages" had the strongest association with customers' intention ($r=0.770$, $p=0.000 < 0.01$). Correspondingly, trialability and observation were found to have strong positive correlations with the intention ($r =0.661$ and $r =0.629$, $p=0.000 < 0.01$, respectively). Compatibility was also related in a moderate effect ($r=0.459$, $p=0.000 < 0.01$). The indices of complexity show a negative relationship with the intention ($r = -0.330$, $p=0.000 < 0.01$). In other words, the higher customer intentions, the lower complexity and vice-versa. In contrast, the factor of perceived risks had no relationship with the intention because p exceeds 0.01 ($r = -0.133$, $p=0.156 > 0.01$).

Regression Analysis

Multiple regression analysis was employed to identify significant effects of the independent variable (customer intention) to the dependent variables (6 perceived attributes). It also examines the contribution of innovation characteristics to the prediction of adoption rate. Given the results in Table 4, the relationships among independent variables and dependent variables were statistically significant. Its implication explains 62.4% variations in the adoption rate (Adjusted $R^2 = 0.624$, standard error of the estimate= 0.34). This model was a good explanatory power of dependent variables. The ANOVA results in Table 5 represent the significance of the model. F-ratio concluded that independent variables could significantly predict the adoption of crowd shipping (F=32.476, p=0.000<0.001).

Table 4: The model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.802[a]	.643	.624	.340	1.987

a. Predictors: (Constant), O, R, CX, C, RA, T

b. Dependent Variable: I

Table 5: Analysis of Variance (ANOVA)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.528	6	3.755	32.476	.000[b]
	Residual	12.486	108	.116		
	Total	35.014	114			

a. Dependent Variable: I

b. Predictors: (Constant), O, R, CX, C, RA, T

Beta coefficient implies the contributions of each attributes to the model. Given findings in Table 6, the indices demonstrated the proposed hypotheses. Relative advantages made a positive and significant contribution to the rate of the adoption (β=0.599, p=0.000<0.05), followed by the observation (β= 0.017, p=0.000<0.05). This leads to the two most important constructs affecting the technology adoption. When two key determinants increase, the rate of technology adoption also increases. Two hypotheses (H1 and H6) were supported in the customer adoption. As previously described, three hypotheses (H2, H3, H5) had relations with adoption in the correlation matrix. However, they were not significant in the regression analysis. Therefore, these hypotheses were rejected because of p>0.05. Lastly, H4 was not supported because of no correlation and significant degree. The result summary of hypotheses testing is shown in Table 7.

Table 6: Beta coefficients in the multiple regression analysis

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.142	.315		3.627	.000		
	RA	.546	.078	.599	6.968	.000	.447	2.239
	C	-.103	.067	-.122	-1.541	.126	.529	1.889
	CX	-.008	.047	-.012	-.168	.867	.671	1.490
	R	.006	.040	.010	.162	.871	.827	1.209
	T	.088	.081	.104	1.091	.278	.360	2.776
	O	.210	.086	.257	2.433	.017	.296	3.382

a. Dependent Variable: I

Table 7: The result summary of the hypothesis testing

Hypotheses	Decision
H1: Relative advantage has a positive significant influence on customers' behavior towards the adoption of crowd shipping.	Accepted (β=0.599, $p < 0.05$)
H2: Compatibility has a positive significant influence on consumers' behavior towards the adoption of crowd shipping.	Rejected ($p > 0.05$)
H3: Complexity has a negative significant influence on customers' behaviors towards the adoption of crowd shipping.	Rejected ($p > 0.05$)
H4: Perceived risk has a negative significant influence on customers' behavior towards the adoption of crowd shipping.	Rejected ($p > 0.05$)
H5: Trialability has a positive significant influence on customers' behavior towards the adoption of crowd shipping.	Rejected ($p > 0.05$)
H6: Observability has a positive significant influence on customers' behavior towards the adoption of crowd shipping.	Accepted (β= 0.017, $p < 0.05$)

4.2 The Individual Interviews

The semi-structured interviews were conducted with five random individuals. The interviews aimed at obtaining study-related information from personal opinions. Open-

ended questions were used to orient interviewees to the examined topics. The 15-minute interviews were implemented via Skype. All interviews were organized based on the same topic list of questions (Appendix 2).

All five interviewees said they had constant frustration in standard delivery options. Late deliveries, no full of visibility and poor communication caused the customer dissatisfaction in respect of the last-mile delivery. The poor tracking update was the fundamental factor of customer frustration:

"Although the tracking code was provided, the status of my order was not constantly updated". "No regular updates drove me unhappy because I did not predict when it would arrive"

Unpleasant experiences were continuously repeated about the breaking promises of retailers:

"Retailers keep promising about the traceability however the reality is much different from the advertisement. I did not know why my shipment had no movement for two days".

The poor tracking system also impacted on customer daily routines when they felt passive in arranging their time appropriately:

"Tracking details are only shown a date of shipment dispatch. Nothing is displayed further in the website even until the shipment reaches my address".

"I cannot organize my time when I am not notified about the order status".

Late deliveries lowered customer satisfaction when it resulted in constant inconvenience. The respondent complained:

"A shipment was supposed to be delivered in the morning. However, it was delivered two hours later, causing me to stop my plans for waiting".

Another interviewee had a similar experience: "I was given to receive my order […]. I was in all-day waiting. Nothing was delivered and no announcement for delay".

They all agreed: "Delayed deliveries make [us] disappointed".

Regarding communication, five respondents all experienced limited pre-notification from retailers. Most brands only announced an estimated date of delivery. No pre-alerts are sent before parcel collection. Therefore, the customer cannot ready to expect a package to reach the final destination. It is a primary cause of failed deliveries.

"I was disappointed at the poor notification. A shipper called me to get a parcel when he was at the front of my house. Meanwhile, I was not at home. The failed delivery drove me angry, as I have to wait for the parcel again"

The on-time deliveries, the live order tracking, and the proactive communication are core capabilities to satisfy cyber shoppers. If these features are not met, customer retention is heavily impacted. They tend to lose trust in retailers. They would try a new brand or retailer for a better service. Customers not only perceive satisfaction in check-out, but they also expect the added values in the post-purchase.

"I am likely to leave [the brand] to another after I get a terrible service". Then, "Although [brand] products are cheaper than their competitors, I no longer use it […]. Lots of e-retailers offer the same items here [in Vietnam], I can try different retailers to find a better service".

In addition, word of mouth is the most valuable forms in the brand advertisement. It reflects customer perceptions about service quality. Social media is a common way to review sharing.

"I recommended my friends and family not to use [a brand] because of a bad delivery rating". "I spread my bad reviews of how disappointed and unimpressed I experienced".

With respect to crowdsourced delivery, five respondents had great knowledge of crowdsourced-based platforms, for examples: online food delivery services and ride-hailing services in Vietnam. Two of those praised the outstanding features of the crowdsourced service. When the likelihood of future use was asked, four participants would use it while the other kept the neutrality.

"I will choose the service if I need". "If a shipping charge is affordable, I will choose this option.".

On the matter of individual concerns, the shipping charge is the fundamental factor of the purchase decision. One respondent raised a question:

"What if a retailer's warehouse is much far from my house, the shipping rate increase".

Additionally, respondents were concerned about liability and privacy. However, their negative concerns would get declined if they chose legacy retailing brands.

"I am not sure the product authority when a gig shipper delivers. The product might be changed on purpose' […] sharing the recipient's address to gig workers is not as reliable as contracted couriers".

"If needed, I will try the service offered from famous brands which I am loyal in a long-time use".

5   Conclusions

Three key research questions in the section 1.2 are answered as follows:

a. To what extent do perceived attributes influence the consumers' adoption of crowdsourced Delivery in Vietnam?

The empirical study investigated the consumer intention to use the crowdsourced delivery in Vietnam's e-commerce market with Roger's diffusion theory. Based on data obtained, the theory was used to explain the consumer intention influenced by the measured attributes. They were also considered to reliably predict the adoption of crowdsourced delivery. The results confirmed that two determinants (relative advantages and observation) had positive significant correlations with the consumers' adoption. There was no relationship between perceived risks and customer intention. The remaining four attributes had no significant effects although they had certain relationships with the rate of adoption. Each perceived attribute are discussed in the following paragraphs.

It was no surprise that the predictor "relative advantages" was the most influential on increasing the rate of adoption towards crowdsourced delivery. The figures represented a positive significant correlation with $r=0.626$, $p=0.000 < 0.01$ and

β=0.599, p=0.000<0.05. The beta coefficient explained that the more adopters appreciated the benefits, the higher the chance of 0.599 they would adopt the service. The highlights of crowdsourced delivery are apparent, namely the fast delivery, the affordable rate, the real-time tracking, and the proactive communication. Key benefits resolve the customer inconveniences and gain the customer retention as compared with the traditional offerings.

Contrary to expectations, compatibility was found an insignificant effect on the adoption decision. However, the construct still had a strong positive correlation towards the consumer intention. The overall responses showed the high mean of 3.81 for three sub-dimensions: the service fits "a hectic life", "immediate demands", and "environmental awareness". In particular, 70% of the respondents selected "agree and strongly agree" on the "hectic life". Customers felt the service compatible with their immediate demands by 67%. Lastly, over half of the respondents (57%) found compatibility of crowd shipping and their environmental awareness. Retailers should find more factors compatible with customer attitudes.

Complexity had a negative influence on customer intention in spite of the hypothesis rejection in the effect significance (r = -0.330, p=0.000 < 0.01). The overall complexity responses fell in the mean of 2.44. It implied that the participants did not feel complicated in service use. The young and savvy respondents had great knowledge of the crowdsourcing system based on their current experiences. However, the complexity builds barriers in declining consumers' motivation to purchase the service. Entrepreneurs should have a great caution in this factor. For example, the service operates in the internet-based platform so that the platform should have no hassle-free and easy-to-use. These features lead to an increase in adopters.

As unanticipated, perceived risks had no relation to the customer intention. It did not affect the likelihood of adoption. The overall mean of this attribute was 3.49 with three items: "sharing a personal identity", "receiving a parcel from strangers", and online payment. The findings explained that Vietnamese consumers were less likely to feel obstacles from the predictive risks so they were prone to use the service. Therefore, employees should constantly reduce potential risks and highlight the benefits of service adoption as well.

Trialability facilitated the potential use of crowdsourced delivery because of the strong correlation coefficient (r =0.661, p=0.000 < 0.01). Customers tend to experience a service trial after observability. Besides the key benefits, companies should create impressive promotions or incentives to stimulate customers to adopt the service.

Observability was demonstrated to have a positive significant contribution to the customers' intention (r=0.459, p=0.000 < 0.01 and β= 0.017, p=0.000<0.05). Customers could observe others using the service before using the service by themselves. They were looking for those who used this service as an experiment. A higher number of service users indicates positive feedbacks of the service. Customers are likely to trust users' reviews and a number of users to make a purchase decision. A crowd is greatly involved in customers' purchase decisions. Therefore, retailers should deliberately make a plan on how to spread the service on a large scale and catch customers' attention.

The in-depth interviews explored the consumer views on current problems of the last-mile delivery and the new service- crowdsourced delivery. All respondents gave complaints about the conventional home delivery. Late deliveries, the weak visibility system, and the poor communication were three main shortcomings which resemble the most delivery problems derived from the previous online survey (63%, 51%, and 37% respectively). Out of the five interviewees, two respondents (40%) acknowledged that crowd shipping was more advantageous. The majority of the interviewees (80%) were willing to use crowd shipping in the future with great interest. The initiative was praised to meet Vietnamese consumer preferences of the home delivery and personalization possibilities. Despite the high likelihood of adoption, its pricing was doubted in comparison with the traditional services, especially a free-shipping method. Thus, price was attributed to high purchase decisions. Likewise, word-of-mouth was estimated as a direct behavioral influence on customers' purchase in Vietnam. The individuals in the interview also shared the same privacy and trust issues. However, the participants considered that potential risks could be manageable in a choice of legacy retailers, concerning brand trustworthiness.

In summary, the findings of the research showed that the Vietnamese consumers were more likely to adopt the new delivery service- crowd shipping. The consumers had great knowledge and certain interests in the application of new service. Determinants influencing the behavioral purchase motivation were carefully analyzed, including the advantages, the observability, and the price. Lastly, the potential consumers did not only intend to use the service, but they also tended to encourage others in adoption by giving online reviews.

b. How should crowdsourced delivery solve the current challenges of Vietnam's last-mile delivery?

With the youthful population and the high internet usage rate, Vietnam has become an attractive e-commerce market in Asian. However, Vietnam's explosive growth of online trading is a double-edged sword to companies. In order to achieve customer retention, last-mile delivery is critical in the age of e-commerce. In the tendency of on-demand services, the national challenges have impacted retailers and logistics providers on both the operational efficiency and customer satisfaction. The last-mile services are suffering from the combination of traffic congestions and poor roads in Vietnam. These factors cause unexpected delays in deliveries. Meanwhile, online shoppers expect faster deliveries to fit their hectic lifestyles. Same-day and next day deliveries have become standards in online shopping. Secondly, technological advancements in Vietnam are developing at a slow pace as opposed to Vietnam's fast-growing e-commerce landscape. Although a better tracking system and proactive notifications are impressive promises from companies, they disappoint consumers by actual services. These broken promises happen at a higher risk of "not-at-home". Failed deliveries raise customer unhappiness and unexpected costs. Moreover, Vietnam has not welcomed collection points and parcel lockers yet. The insufficient logistical infrastructure challenge companies into parcel consolidation, which increase operating costs. In the deep-root cash population, the COD is the most preferred choice in e-commerce transactions. It creates a financial difficulty due to low monetary circulation. In general, Vietnamese consumers prefer face-to-face deliveries due to the loss of online trust and fear of fraud.

In order to tackle current logistics challenges, crowdsourced delivery is considered an innovative solution in the field of package transportation. The service is a peer-to-

peer service that pools independent drivers to make a delivery voluntarily. It provides prompt deliveries, live tracking by geolocation and affordable charges. The outstanding features of crowd shipping solve the logistical constraints in Vietnam. The alternative brings mutual benefits to consumers and companies. The more increasing logistical performance, the higher customers trust. Crowdsourced delivery is a cost-effective answer to e-commerce players.

Millennials and Gen Z are the two main classes of high-spending consumers in Vietnam. Young Vietnamese consumers are looking for initiatives to match their fast-evolving preferences. They are more receptive to adopt an innovative service. Moreover, they are well-familiar with crowdsourcing services. It is easier to launch the crowd shipping with great familiarity. Therefore, crowdsourced delivery has a high potential to stand in Vietnam's transport sector.

c. How retailers should concentrate on the application of crowdsourced delivery in Vietnam?

In order to release the crowd shipping services, retailers and logistics providers should take great considerations and make adoption strategies to attract more customers.

As previously mentioned, a factor "relative advantages" is a fundamental determinant which attracts more consumers. Companies should promote the exclusive benefits of crowd shipping offered on a large scale through online advertisements. As crowd shipping is a new service introduced to the market, reaching a wide base of adopters is a critical success at the very first stage of adoption. The creation of critical mass causes greater consumers' purchase motivations. Vietnamese consumers are prone to choose a more competitive service than traditional options. The alternative addresses quick delivery, real-time geolocation tracking, and flexibility, which cause consumers' ease of frustration. Furthermore, the competitive advantages result in good observation. The factor stimulates more consumers in acceptance of the crowdsourcing delivery. The emphasis of high compatibility between customer demands and impressive functionality conveys consumers' decision to use this service.

On the other hand, complexity contributes to high adoption friction, which makes customers abandon the service. In order to support users in an easy adoption, user-

friendliness and technological usability should be prioritized in the innovative crowd shipping. Incremental improvements should be implemented to ease complexity during practice. Although risks were found no relationship with the consumer adoption in the results of questionnaire , they were concerned in the individual interviews. Risks of fraud and privacy bleach should be secured to give customers' comfort. Negative concerns should not be underestimated. Constant risk forecasting would diminish future failures and customer unhappiness.

In spite of the outstanding advances, the innovation may not reach a full-scale adoption. Vietnam in which cash is the king of consuming transactions upon delivery. In efforts to have more adopters, the physical payment is a barrier to limit adopters. Therefore, companies should continuously offer the COD in the early adoption stage. At the same time, attractive promotions on electronic payment are implemented to encourage more customers to use this method. The consumers' skepticism of e-pay could eliminate when they feel safe in the reliability and quality of the brand and services. In Vietnam's notoriously price-sensitive community, affordable shipping charges are taken into account. Although Vietnamese consumers are willing to pay a premium, in practice those consumers are still limited. Hence, marketers would offer incentives and promotions to raise the perceived value of the product. For instance, either discounts or free of charge would be provided to push customers to the adoption faster.

Last but not least, Vietnam's small and medium-sized retailing companies are small-capitalized players in last-mile investments. They could incorporate with technology-driven startups. These start-ups help retailers keep up with same-industry giants in a race of on-demand services. To ensure the reliability of the service, a professional carrier is still involved in the supply chain.

6   Discussion

The study provided the landscape of Vietnam's last-mile. Although Vietnam's e-commerce prosperity, national issues (the urbanization, the poor road infrastructure, weak technologies, and the logistics facilities) have been hindered delivery capabilities. They pressurize retailers and logistics providers to match customers'

expectations in a cost-effective manner. In order to encourage transport alternatives, crowdsourced delivery is suggested. The innovation has a high potential to improve the last-mile performances in both economic and environmental-friendly aspects for stakeholders.

The empirical approach proved the effects of Rogers' six main underlying characteristics in the behavioral intention towards the adoption of crowdsourced delivery. Based on the findings of this study, "relative advantage" and "observation" were found to be the most influential determinants of the innovation adoption. The Vietnamese consumers were prone to adopt crowdsourced delivery service when they recognized more benefits and a high number of users before trials. Trialability, complexity, and compatibility had moderate relationships in the customer intention despite they were statistically insignificant predictors. On the contrary, there was no relationship between perceived risks and customers' intentions in diffusion. The interview results gave a deeper insight into consumer views. Interviewees shared their opinions corresponding with the online survey. Data privacy and trust were the fundamental concerns in potentials risks, as opposed to the survey data. Therefore, companies should value customers' privacy by warranties, which lessen a rate of consumer rejection. The results of interviews showed that cost and word-of-mouth should be emphasized as critical factors to consumer buying decisions.

Crowdsourced delivery is a new concept in Vietnam, strategies and contingency plans should be made in stages of the adoption process. In order to increase the rate of diffusion, retailers and logistics providers should fully understand the importance of each attribute and enhance their aspects by strategic plans. Benefits and observability are the strongest determinants so they are should be comprehensively identified. Besides, the ease of use and minimal risks should be paid attention and continuously enhanced. The design of contingency plans allows retailers to have quick resilience and minimize customer inconveniences after unforeseen events. Most buying decisions come from price-consciousness, which was obtained from the interview. Pricing causes consumers to puchase reluctances in the service application. An appropriate pricing policy should be comprehensively considered to promote the adoption more viable. Additionally, discounts and promotions on the service would attract more customers. The COD is continuously employed in the

system for carefree. Lastly, the word-of-mouth has its unique power to decide the new service success, impressive changes and promotions may keep customer retention and positive reviews.

By comprehensively understanding economics, the competitive advantages of crowd shipping overtake the inefficiency of traditional shipping methods. Crowd shipping does not lead to substitute existing fleets. It is used to improve the company's existing fleets. The crowdsourced system enables to manage dramatic demand spikes in peak seasons. The innovative platform is ideal for small and medium enterprises to overcome the race of last-mile deliveries with constrained financial capabilities. Furthermore, the model gives online shoppers more shipping options, which fit their current needs. It also differentiates their delivery experiences.

As previously mentioned, academic research was constrained by the authors' research acceptance and high-cost access. Apart from the academic studies, commercial journals and reports were preferably used as secondary data sources in the literature review. Regarding the data quality and reliability, the study was acceptable at a moderate level since the information was cited from logistics-specialized publishers and legacy logistics providers. Next, the small sample size limits the generalization of the study on a larger scale. In the scope of the study, six main characteristics of Roger's diffusion was analyzed. However, other factors affecting customer intention are excluded from the research. Hence, future studies could also increase the sample population. They could exploit customer intention through different aspects to have a better understanding of diffusion.

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Appendices

Appendix 1.   Customer behaviors toward the crowdshipping adoption

We are going to ask you about your behavior in regards to crowdsourced delivery. Your responses are essential for us and will be kept confidential. Through the survey, we have a better understanding of customer behaviors towards the adoption of a crowd shipping in Vietnam's freight transport. Thank you for your cooperation.

Part 1: Socio-demographics

1. What is your gender?

a. Female

b. Male

2. What is your age?

a. Under 18

b. 18 to 22

c. 23 to 29

d. 30 to 38

e. 39 to 50

f. Above 50

3. What is your current occupation?

a. Student

b. Employee

c. Self-employee/ entrepreneur

d. Freelancer

e. Unemployed

f. Retired

Part 2: Online shopping experience

4. How often do you go online shopping?

a. Every day

b. Every week

c. Every month

d. Rarely

e. Not at all

5. What types of products do you often buy online? You can select more than one answer choice.

a. Clothing and accessories

b. Health and Beauty

c. Books, gifts

d. Electronics

e. Groceries and perishables

f. Appliances and furniture

6. What location do you prefer to collect your package conveniently?

a. Home

b. Office

f. In-stores

g. Collection points

7. What type of payment you prefer to pay for your online order?

a. Cash

b. E-Payment

8. What of the problems below did you badly experience with online delivery?

a. Late delivery/ A long wait for delivery arrival.

b.   Not at home for order pick-up.

c.   No alerts of notification in advance.

d.   Lack of order tracking.

e.   No rescheduling after an order confirmation.

9.   Have you ever heard of crowd-sourced delivery?

a.   Yes, I already used the service.

b.   Yes, but I have not used the service.

c.   No, I do not know the service.

Part 3: The perceived innovation attributes

How interested would you be in following statements. Please indicate on the scale your level of interest for each statement in the list

1.   Relative advantage: Please rate your agreement about advantage

RA-Relative advantage	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
RA1- I have ultra-fast delivery					
RA2- Its charge is cheaper than typical express shipping.					
RA3- I have a greater control over my shipments via live, real-time tracking.					
RA4- I have proactive alerts via SMS/email.					

2.   Compatibility: Using crowdsourced delivery would fit

C- Compatibility	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
C1- my hectic lifestyle (not waiting all day for parcel collection)					
C2- my immediate demands.					
C3- my environmental concerns.					

3. Complexity: Using the crowdsourced delivery, I feel

CX- Complexity	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
CX1- Its app is difficult to understand and use.					
CX2- Its app is complicated to use.					
CX3- It is confusing of cancellation in-transit.					
CX4- I am likely to avoid communicating with a shipper.					

4. Perceived risks: When using the crowdsourced delivery, I worry to

R- Perceived risks	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
R1- share my personal information to crowd shippers.					
R2- receive a package from a shipper without a uniform.					
R3- Online payment.					

5. Trialability: I can try out the crowdsourced delivery because:

T- Trialability	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
T1- It is easy to try the service					
T2- I have a trial as needed.					
T3- It is better to experiment with the service before adopting them					
T4- I can access it adequately.					

6. Observability: By observing how others use crowdsourced delivery to receive parcels, I feel:

O- Observability	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
O1- Crowd shipping process is clear to me.					
O2- I saw benefits of crowd ship-ping.					
O3-I can explain to others how to use the service.					
O4- I can recommend others to use the service.					

7. Intention to use

I- Intention to use	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I1- I will use it for my next online purchase					
I2- I will use it as needed					
I3- It is my favorite service					

Appendix 2.   Interview questions

1/ Do you often shop online?

2/ What major delivery problems make you unhappy?

3/ Have you ever known crowdsourced services?

4/ What is your opinion of crowdsourcing based model in parcel delivery?

3/ Do you have any concerns about the crowdsourced delivery? If yes, share your thoughts.

Appendix 3.   Correlation of perceived attributes in the adoption

RA- RELATIVE ADVANTAGES	1	2	3	4	5	M	SD
I have ultra-fast delivery	0%	1%	35%	38%	24%	3.87	0.789
Its charge is cheaper than typical express shipping.	0%	4%	33%	51%	10%	3.66	0.712
I have a greater control over my shipments via live tracking	0%	3%	30%	43%	21%	3.83	0.805
I have proactive alerts via SMS/email.	0%	3%	30%	50%	16%	3.80	0.740
Total						**3.79**	**0.608**
C- COMPATIBILITY							
my hectic lifestyle	0%	1%	27%	48%	22%	3.92	0.727
my immediate demands.	0%	3%	27%	46%	21%	3.86	0.783
my environmental concerns.	2%	6%	33%	41%	17%	3.64	0.890
Total						**3.81**	**0.652**
CX- COMPLEXITY							
Its app is difficult to understand and use.	20%	44%	26%	6%	2%	2.24	0.904
Its app is complicated to use.	20%	43%	29%	5%	2%	2.25	0.897
It is confusing of cancellation in-transit.	11%	30%	32%	20%	3%	2.75	1.042
I am likely to avoid communicating with a shipper.	23%	26%	30%	15%	4%	2.51	1.127
Total						**2.44**	**0.830**
R-PERCEIVED RISKS							
share my personal information to crowd shippers.	8%	6%	23%	47%	13%	3.53	1.062
receive a package from a shipper without a uniform.	6%	4%	19%	50%	17%	3.71	1.015
Online payment.	12%	7%	34%	38%	7%	3.22	1.090

Total						**3.49**	**0.878**
T- TRIALIBILITY							
It is easy to try the service	1%	0%	27%	38%	30%	4.01	0.832
I have a trial as needed.	0%	2%	31%	45%	18%	3.83	0.760
It is better to experiment with the service before adopting them.	0%	3%	32%	48%	15%	3.74	0.750
I can access it adequately.	0%	3%	29%	51%	16%	3.80	0.728
Total						**3.85**	**0.656**
O- OBSERVABILITY							
Crowd shipping process is clear to me.	0%	2%	35%	43%	17%	3.78	0.758
I saw benefits of crowd shipping.	0%	1%	30%	47%	20%	3.88	0.739
I can explain to others how to use the service.	0%	3%	28%	50%	17%	3.83	0.741
I can recommend others to use the service.	0%	0%	30%	46%	21%	3.91	0.732
Total						**3.85**	**0.678**
I - INTENTION							
I will use it for my next online purchase.	0%	0%	10%	52%	34%	4.24	0.643
I will use it as needed.	0%	0%	27%	47%	23%	3.96	0.730
It is my favorite service.	0%	1%	39%	44%	12%	3.71	0.710
TOTAL						**3.97**	**0.554**

Appendix 4.   Correlations of Roger's innovation characteristics

Correlations

		I	RA	C	CX	R	T	O
I	Pearson Correlation	1	.770[**]	.459[**]	-.330[**]	-.133	.629[**]	.661[**]
	Sig. (2-tailed)		.000	.000	.000	.156	.000	.000
	N	115	115	115	115	115	115	115
RA	Pearson Correlation	.770[**]	1	.592[**]	-.332[**]	-.186[*]	.665[**]	.665[**]
	Sig. (2-tailed)	.000		.000	.000	.047	.000	.000
	N	115	115	115	115	115	115	115
C	Pearson Correlation	.459[**]	.592[**]	1	-.220[*]	-.067	.580[**]	.637[**]
	Sig. (2-tailed)	.000	.000		.018	.474	.000	.000
	N	115	115	115	115	115	115	115
CX	Pearson Correlation	-.330[**]	-.332[**]	-.220[*]	1	.364[**]	-.270[**]	-.472[**]
	Sig. (2-tailed)	.000	.000	.018		.000	.003	.000
	N	115	115	115	115	115	115	115
R	Pearson Correlation	-.133	-.186[*]	-.067	.364[**]	1	.000	-.139
	Sig. (2-tailed)	.156	.047	.474	.000		.999	.139
	N	115	115	115	115	115	115	115
T	Pearson Correlation	.629[**]	.665[**]	.580[**]	-.270[**]	.000	1	.753[**]
	Sig. (2-tailed)	.000	.000	.000	.003	.999		.000
	N	115	115	115	115	115	115	115
O	Pearson Correlation	.661[**]	.665[**]	.637[**]	-.472[**]	-.139	.753[**]	1
	Sig. (2-tailed)	.000	.000	.000	.000	.139	.000	
	N	115	115	115	115	115	115	115

[**]. Correlation is significant at the 0.01 level (2-tailed).

[*]. Correlation is significant at the 0.05 level (2-tailed).