

Consumer's point of view on parcel lockers in DKI Jakarta

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Abstract. Online shopping businesses grow significantly in Indonesia, especially in Jakarta. Consumers find out that purchasing products online is more effective. Most of consumers in Jakarta choose direct (home) delivery as their last-mile delivery method, which proposes consumers to receive the purchased goods at home. E-commerce could minimize trip distance travelled by consumers, but distance travelled by delivery service vehicles increase. It causes new problems such as environmental issues. Parcel lockers method appeared as the solution, which proposes advantages for consumers and package delivery operators. Its scheme could minimize distance travelled by both. The packages that dropped in the lockers would be picked up, sorted, and delivered to other lockers. Consumers would pick up their goods by travelling to destination lockers. It could minimize delivery trips. This study observed the consumer's point of view on parcel lockers method, and analyse the potency of parcel lockers. This study was carried out by two online surveys with four main variables that are location, information, cost, and punctuality. The results found that punctuality is the most affecting factor (38.8%) for consumers in choosing type of delivery service. Based on the services, respondents prefer to choose parcel lockers (68.4%) rather than direct delivery.

1 Introduction

Online method becomes a new innovation in shopping nowadays. This shopping method affects consumer's behaviour on how they purchase products, i.e. in term of how they go to the stores. In online shopping, the consumers find an easier way to purchase goods, that is without doing trip to the store. In last 20 years, online business's growth is about 5% ~ 90%. Another data shows that online shopping's growth in 2010 until 2015 around the world was significant. In 2010, sales amount in online shopping was about US\$ 820.000.000.000 and it reached US\$ 2.251.000.000.000 in 2015 [1].

Online business has advantages on number of trips and carbon emissions produced. Study in Netherland showed that distance travelled would be increased as the consumer purchase goods conventionally in comparison with online system and parcel delivery system (116,25 km/month in average, 22,69 km/month in the worst case, and 15,34 km/month in realistic condition). On the other hands, carbon dioxide produced has similar results with the distance travelled (11,86 kg/month, 7,13 kg/month in the worst case, and 4,76 kg/month in realistic condition). The comparison between NO_x, PM₁₀, and SO₂ also decreased, that is from 45,7 kg/month become 39,2 kg/month [2].

Parcel delivery service is a process where goods are delivered from the retailers to the consumers in last mile delivery phase of online shopping. Though the number of consumer trips in conventional shopping is more than

online shopping, the existence of online business would increase the number of trips for goods. It is because the consumers' order must be delivered to the final destination. In general, the destination addresses are consumers' home or their close related person's. [3].

Parcel delivery in online business has more number of trips when compared with conventional business. As we focus on another part, the consumers will have minimum number of trips because they do not have to go to the stores to get their products. However, in fact, these two trips become a new complex problem if the consumers combine to purchase products by conventional and online method. Eventually, this condition causes the delivery companies travel repeatedly in purpose to fulfil different consumers' needs and requests based on the delivery time. It will make the delivery trips become ineffective [4].

The increase of the number of trips lead to some problems. It increases the distance travelled by the package delivery vehicles, and it automatically increases vehicles gas emissions. Therefore, we need solutions in order to fix these problems and make online business more effective and efficient.

One of the solutions is to simplify the supply chain process, specifically in transportation sector. Several countries have applied the solution. One of them is Belgium, which applied mobile depot scenario on TNT Express; one of respectable logistic company. Mobile depot scenario is container vehicles that is used to deliver goods from retailers to consumers intracity. Mobile depot

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scenario is projected to replace business-as-usual scenario, which represent package delivery method in Belgium. This solution is used by TNT Express to solve the existing problem such as traffic congestion related to package delivery. The results are mobile depot scenario could reduce number of trips from 1,34 km to 0,52 km. Indirectly, mobile depot scenario decreases 24% of CO₂ and 59% of PM₂ in gas emissions [5].

Moreover, New York City had applied new regulation for urban distribution center (UDC) system. This system would simplify the supply chain from retailers to consumers, where the products that have been ordered by consumers would not be delivered to their address. The delivery process divided periodically in order to maximize number of packages that could delivered by logistic vehicles, and the package would be dropped in a specific place located in the city center. Hence, consumers could pick up their package closer to their address or location [6].

Another way to reduce number of trips is by using parcel lockers or usually called as collection points. This method is a new technology in logistic transportation. Parcel lockers is a machine that has function as a delivery medium located in strategic area. Most strategic area of parcel lockers is a crowd location visited by citizens. Those locations are office, apartment, train station, shopping center, etc [7].

Indonesia is one of several countries that has significant development on e-commerce sector with business value of e-commerce in 2015 reach US\$3,56 billion or equivalent to Rp 46 trillion. This number will grow in the future, and it is predicted to become US\$ 4,89 billion or equivalent to Rp 68 trillion in 2016 [8]. Based on research held by ICD, Indonesia is predicted to have 4% growth in e-commerce market.

With the growth of online business in Indonesia, especially in DKI Jakarta which represent Indonesia central of economy, package delivery problem to the end consumers (last mile delivery) become crucial. On the other hands, mobile depot scenario and urban distribution center appear as new solution. Considering that parcel lockers system is not success yet in Jakarta, this study is aimed to observe consumers perception, and potency of parcel lockers in Jakarta.

Section 2 will discuss the literature review concerning the supply chain of online business and the operation of parcel lockers. Section 3 will discuss research method, and section 4 will be focused on the results of the observation. Finally, section 5 will conclude this study.

2 Literature Review

2.1 Supply chain system in online business

E-commerce or electronic commerce is a process of buy and sell product by consumers and from one company to another company by using world wide web as the media of business transactions (Miftah, Susilo, & Riyadi, 2015). E-commerce business model is supported by three main elements, those are sourcing, it is a process of recruitment or looking for the sellers or retailers in order to sell the

products online; e-market place or usually called online store, it is a medium for retailers to offer the products as attractive as they could in the website to attract the consumers; and the last mile delivery, it is delivery process of products that have been ordered by the consumers, and the retailers become the sender.

E-commerce consists of three activities, those are processing, it is sorting and cross-docking activity; transporting, it is transportation process of products from the retailers to the delivery centers/processing centers; and delivery, it is products shipment process to the end consumers.

The most important components of logistic process of e-commerce are transportation and warehousing. It is important to keep the quality of the products, as well as cost and time so as the product could be delivered efficiently from the origin to the end destination.

In the development of economy, e-commerce logistic process is the latest form of evolution in logistic and physical distribution network for the last 40 years.

As the e-commerce logistic model is classified by the type of facilities used, it is divided into three types. The first is mega e-fulfillment center that used warehousing facility. The purposes of this facility are to keep the products that are operated by the retailers. The area of warehousing is about 50-100 Ha and operated 24 hours in 7 days (24/7). The second one is parcel hubs/sortation center for sorting the products according to the postal code. The products that have been sorted will be sent to the consumer or collecting point. The third facility is parcel delivery center, which deliver the products to the consumer points.

E-commerce logistic model is designed to complete e-fulfillment function that is important for online distribution network. The order is processed by ICT (information, communication, and technology) application system in order to simplify the identification of product which would be sent from the warehouse using two scenarios. The first scenario is delivery process to local depot, and then the goods would be delivered to the consumers or pick up points. The second scenario is delivering goods to the parcel hubs in order to do sorting activity in the sortation center. After sorting process is done, the sorted goods will be processed in the parcel delivery center in order to be distributed to consumers or pick up points.

In recent years, the trend of post and courier service has been changed to package delivery instead of mail delivery. It has caused the operators of logistic companies participated more in last mile delivery process. In general, logistic company offers big capacity at every logistics point with a big amount of extra charge in transportation cost. It affects in determining the minimum price that would be charged to the shippers or the receivers. It would be difficult to logistics company to do so. Hence, logistic companies try to make innovation by creating package service. Initially, logistic services mostly deal with the warehouse as a starting point and the distribution center as an end destination. Now, consumers need logistic service that could offer delivery service from distribution center to end consumers. Hence, the logistic transportation operation has changes from point to point

(business to business) to point to points (one to many). To maximize the operation, we need to redesign the network, mode selection, and vehicle capacity to support last mile delivery [9].

2.2 Parcel lockers and its practice

Parcel lockers is an innovation to solve last mile delivery problem. There are about 3000 machines operated in different 20 countries. This machine could serve consumers to send and receive goods. Time operations of the machine is 24 hours per day and 7 days per week. To use the parcel lockers method, online business consumers should follow these steps:

- Firstly, customer of parcel lockers register on parcel lockers providers website.
- Consumers pay the service charge.
- The online shopping consumers will choose suitable locker for their goods (based on size).
- Later on, consumers will get notifications of confirmation by email.
- Within 2 working days the goods will be delivered and put into consumers locker’s choice.
- To open the chosen locker, consumer should input the phone number and password that sent by the provider.
- During the delivery process, consumers could trace the current position of their goods.

Consumers have 3 working days to open up the locker and pick up their goods. If they passed over 3 days, the goods that have been delivered would be returned to the nearest branch office of the logistic provider. Parcel lockers security is guaranteed by CCTV and alarm system on the machine. It is to control the quality of parcel lockers service [10].

3 Research method

This study is aimed to analyse the consumers perception and potency of parcel lockers in Jakarta. As the first purpose of this study, perception is represented by consumers opinion on the package delivery methods (parcel lockers and direct delivery) based on their initial knowledge. Perception is assessed through the analysis on the choice of package delivery methods which are based on four main factors, i.e lockers and home location, tracking information, cost of delivery service, and punctuality of package delivery. The all factors are assumed to have same weight. The choices of delivery method of this part come from the online survey that was carried out (it is called first survey). The survey result was analysed by descriptive analysis.

The second purpose is to analyse the potency of parcel lockers which is represented by the choices of delivery methods of the respondents whereas they are firstly informed the advantages and disadvantages of both delivery methods (parcel lockers and direct delivery) in their online shopping. The previous four delivery factors were also applied, and in this part of study the weight of each factor is considered using the Analytical Hierarchy Process (AHP). AHP analysis is supported by Expert Choice software. AHP structure drawn in Figure 1.

For the second purpose, the informations related to advantages and disadvantages of the two delivery methods would be given in the questionnaire. The informations were related to four variables, i.e. location, information, cost, and punctuality.

Location was represented by the location of receiver of the goods. It is represented by the distance between consumers location and locker locations. Information described the system ability to inform the consumers about the delivery steps of the goods or it is usually called as tracking system. Consumers would get the information about current location of the package. The third variable is cost. This study simulated that delivery cost by parcel lockers system was cheaper than direct delivery system.

The fourth variable is time. In this context, time was distinguished into two types. The first one was the time needed by the consumers to travel from their home or other point of activity to the locker location. The second one was the maximum tolerable time for the consumers to travel from their home or other point of activity to the locker location. Based on cross sectional sample formula with 90% confidence level, minimum number of respondents needed in this survey is 68 persons. Respondent is consumer who had an experience to do the online shopping. The consumers must have done online purchasing on fashion products within last three months. Another requirement for respondents were the consumers age, i.e 15-64 years old, and should be lived in Jakarta.

With those study purpose, the online surveys were held twice, each with 247 respondents.

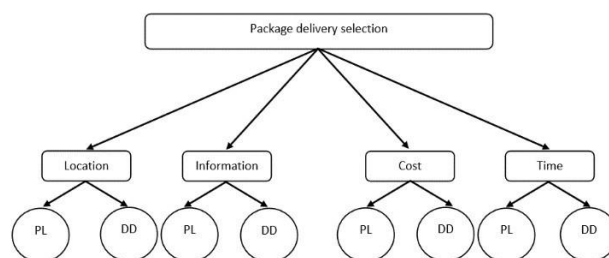


Fig. 1. AHP structure

4 Results and discussion

4.1 Results of statistic descriptive

The results showed that most of the consumers is woman aged 20-24 years old, with income level less than 2.000.000 rupiah per month. Consumers frequently got trouble in home delivery process especially for being late in delivery of their order (53,37%). Moreover, most of consumers have never heard and used parcel lockers (2,59%) before (figure 2 and figure 3).

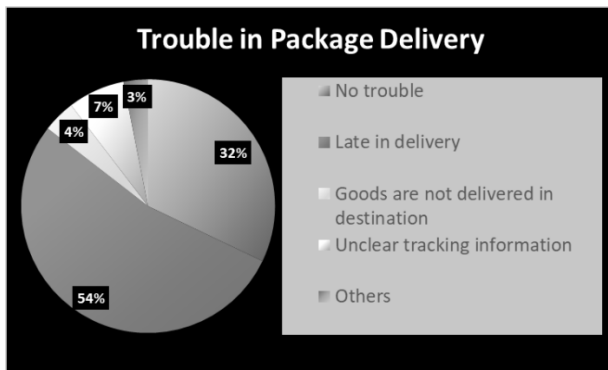


Fig. 2. Consumers experience on package delivery problems

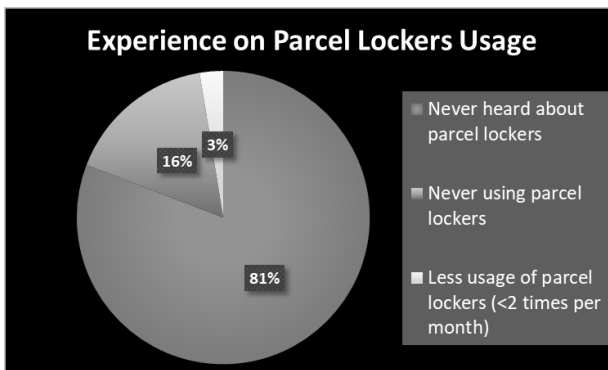


Fig. 3. Consumers experience on usage of parcel lockers

Furthermore, the result of statistic descriptive showed that according to two factors (i.e location and punctuality) the consumers tend to choose direct delivery rather than parcel locker (Table 1). Based on location factor, 85% of respondent prefer to choose direct delivery than the parcel locker, while for the punctuality factor 57.51% prefer direct delivery. On the other hands, consumers prefer parcel lockers than direct delivery based on information factor (67,88%) and cost factor (69,43%).

Table 1. Consumers choice on the first survey

No.	Factors	Methods	Total	Percentage
1	Location	Parcel Lockers	28	14.51
		Direct Delivery	165	85.49
2	Information	Parcel Lockers	131	67.88
		Direct Delivery	62	32.12
3	Cost	Parcel Lockers	134	69.43
		Direct Delivery	59	30.57
4	Time	Parcel Lockers	82	42.49
		Direct Delivery	111	57.51

According to consumers responses, maximum tolerable distance of the locker from their home is about 3.86 km. Moreover, according to the respondents, the ideal price for delivery cost is 8.746,11 rupiah (based on the simulation of delivery from Central Jakarta to South Jakarta). Those numbers were found from the average value of consumers opinion on tolerable distance and cost (Table 2 and Table 3).

Table 2. Tolerable locker distance

No.	Statistic	Distance (km)	
		Existing distance	Maximum distance
1	Average	4.01	3.86
2	Standard deviation	3.35	4.75

Table 3. Ideal delivery cost *)

No.	Statistic	Cost (Rupiah)	
		Existing Cost	Maximum Cost
1	Average	10000	8746.11
2	Standard deviation	-	2184.89

*) Delivery cost (per kg) from Central Jakarta to South Jakarta

As the choices of delivery method were differentiated into gender, there is no significant difference in the choice of delivery method between women and men according to the entire factors. However, as the monthly income was differentiated into the one with monthly income less than Rp 2.000.000 and the one with monthly income more than Rp 2.000.000, there is significant difference in the choice of delivery method between the two groups of monthly income in term of cost. The difference preference of the two groups is about 10%, though both preferred parcel locker than direct delivery. The results showed in Table 4 dan Table 5.

Table 4. Consumers delivery service preference based on gender

No.	Factor	Gender	Method	Percentage
1	Location	Women	Direct Delivery	68.94
			Parcel Lockers	31.06
		Men	Direct Delivery	63.93
			Parcel Lockers	36.07
2	Information	Women	Direct Delivery	32.58
			Parcel Lockers	67.42
		Men	Direct Delivery	31.15
			Parcel Lockers	68.85
3	Cost	Women	Direct Delivery	28.79
			Parcel Lockers	71.21
		Men	Direct Delivery	34.43
			Parcel Lockers	65.57
4	Time	Women	Direct Delivery	58.33
			Parcel Lockers	41.67
		Men	Direct Delivery	55.74
			Parcel Lockers	44.26

Table 5. Consumers delivery service preference based on monthly income level

No.	Factor	Monthly Income	Method	Percentage
1	Location	<Rp 2.000.000	Direct Delivery	66.34
			Parcel Lockers	33.66
		>Rp 2.000.000	Direct Delivery	68.48
			Parcel Lockers	31.52
2	Information	<Rp 2.000.000	Direct Delivery	33.66
			Parcel Lockers	66.34
		>Rp 2.000.000	Direct Delivery	30.43
			Parcel Lockers	69.57
3	Cost	<Rp 2.000.000	Direct Delivery	25.74
			Parcel Lockers	74.26
		>Rp 2.000.000	Direct Delivery	35.87
			Parcel Lockers	64.13
4	Time	<Rp 2.000.000	Direct Delivery	55.45
			Parcel Lockers	44.55
		>Rp 2.000.000	Direct Delivery	59.78
			Parcel Lockers	40.22

4.2 AHP results

Based on AHP analysis, it was shown that punctuality of delivery time is the most important factor that influence consumers in choosing the delivery service (38,8%). It was followed by Cost (25.1%), Location (18.2%), and Information (17.9%). In term of method of delivery, parcel lockers was preferred (68,4%) than direct delivery. The results showed by local weight and global weight in following in table 6

Table 6. Local weight and global weight of package delivery service preference

Factor	Local Weight	Method	Local Weight	Global Weight
Location	0.182	Parcel Lockers	0.739	0.134
		Direct Delivery	0.261	0.048
Information	0.179	Parcel Lockers	0.663	0.119
		Direct Delivery	0.337	0.060
Cost	0.251	Parcel Lockers	0.655	0.164
		Direct Delivery	0.345	0.087
Time	0.388	Parcel Lockers	0.687	0.267
		Direct Delivery	0.313	0.121
Total		Parcel Lockers		0.684
		Direct Delivery		0.316

4.3 The relation between statistic descriptive analysis and AHP analysis

Through the two analysis previously described, it was found that there were correlation between statistic descriptive results and the AHP results. Both analysis would relate consumers current perception with the potency as they were informed about the parcel lockers system.

Based on location factor, consumers would change from direct delivery method to parcel lockers method if locker locations are near to the point of activity or consumers' home. It was confirmed by the AHP result that indicated 73,9% of respondents will choose parcel lockers. It is contrast with descriptive statistic results that show only 14,51% of respondents will choose parcel locker. Based on current distribution of parcel lockers

location, consumers prefer direct delivery since they assume current location of parcel locker were far away from their point of activity or their home. In fact, average distance between locker and consumers homes or points of activity is 4,01 km, while the ideal distance preferred by the consumers is 3,86 km.

In term of information factor, both analysis represent similar result. Consumers tend to choose parcel locker due to its tracking information advantage. It can be concluded that the information factor is not quite an issue for parcel lockers to be operated because consumers believe that information factor of parcel lockers was fit with their requirements.

For the delivery cost factor, consumers would choose the cheapest one than the others. It means that they would use parcel lockers method because of the price in delivery cost is cheaper than the one of direct delivery method. On the other hands, the delivery cost offered by parcel locker was quite similar to the price wanted by the respondents. The existing price for delivery cost was Rp 10,000, while the ideal cost based on the respondent opinions is Rp 8,746 per kilogram from central Jakarta to south Jakarta. It indicated that the price offered by parcel lockers provider is tolerable by the consumers.

Lastly is time factor (punctuality). For this factor, we cannot compare both analysis (descriptive statistic and AHP). It is because the questions in both questionnaires have different purpose. For descriptive statistical analysis, time factor is based on punctuality in delivery day. In AHP analysis, time factor is based on punctuality in delivery hour. The results are quite different. However, for further analysis, the AHP analysis result is more accurate than descriptive statistic result. It is because in AHP analysis the questionnaires were based on punctuality in hours, which is more detail than punctuality in days of delivery.

5 Conclusions

- 1.) Perception in this study is represented by online shopping consumers opinion towards package delivery methods (parcel lockers and direct delivery) based on their current (initial) knowledge. Consumers perceptions on parcel lockers are:
 - a. Most of consumers experienced problem in package delivery, especially in term of being late in receiving the order (53,37%). Besides, only a few of consumers have used parcel lockers (2,59%).
 - b. Based on location and punctuality factor, consumers preferred direct (home) delivery than parcel lockers (85,49% and 57,51%, respectively). On the other hands, based on information and cost factor, consumers prefer parcel lockers than direct delivery (67,88% and 69,43%, respectively).
 - c. Maximum tolerable distance of lockers location with consumers' home is 3,86 km.
 - d. The ideal cost based on consumers opinion is Rp 8.746 per kilogram from Central Jakarta to South Jakarta.
 - e. Gender and monthly income level did not affect the choice of delivery method according to all factors but cost factor. In cost factor, consumers with monthly

- income less than Rp 2.000.000 prefer to use parcel lockers method than direct delivery method with 10% difference of the proportion.
- 2.) Potency in this study is represented by the choices of delivery methods of the consumers whereas they were firstly informed the advantages and disadvantages of both delivery methods (parcel lockers and direct delivery) in their online shopping. The selection was held based on weighted criterias.
- a. Punctuality factor is the most influence factor for consumers to choose delivery method (38,8%).
 - b. Based on the whole factors, consumers prefer parcel lockers than direct delivery method (68,4%).
- 3.) According to the results of potency and consumers perception, it can be concluded that :
- a. Consumers would use parcel lockers if the locker locations are near to their homes or point of activity.
 - b. Tracking information currently offered by parcel lockers system is quite good from consumers point of view.
 - c. Current cost of parcel lockers is acceptable, though the ideal cost from customers point of view is quite less than this current cost.

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