September 25th — 26th, 2017 | Darmstadt, Germany
Interdisciplinary Conference
on Production, Logistics and Traffic
www.icplt.org

Last mile transport of fragmented deliveries: delivery preferences of nanostore owners

Bram Kin[1], Kevin Sterckx, Sara Verlinde[1] and Cathy Macharis[1]

[1]*MOBI – Mobility, Logistics and Automotive Technology Research Centre, Vrije Universiteit Brussels, Belgium*

Abstract. Urban freight transport becomes increasingly challenging. This is particularly apparent for fragmented deliveries to nanostores. Nanostores are widely present in (mega)cities in emerging market economies and the current supply models are no longer feasible. Rather than regular deliveries by van, alternative delivery concepts are available. Whereas the cost-efficiency of these concepts is widely studied, its applicability also depends on the acceptance of the receivers – the nanostoreowers. An empirical study is conducted to validate the importance of 14 delivery preferences. Data are collected in the megacity of Jakarta. Results show that seven delivery preferences are considered to be very important. The preferences are related to the acceptance of alternative delivery concepts.

1 Introduction

Last mile transportation is considered to be the most expensive and inefficient part of the supply chain [1], [2]. This applies even more to (mega)cities in emerging market economies which are growing in numbers and size. Freight transport in these cities is plagued by challenges such as congestion, lack of unloading space and increasing vehicle restrictions [3]. A particularly inefficient freight flow is transport of fast moving consumer goods (FMCG). In these countries, FMCG mostly reach the customer by using the small, independent retail channel (nanostores) rather than through modern retail. There are an estimated 50 million nanostores globally [4]. From a logistics perspective modern retailers rely on distribution centres and cross-docks leading to efficient logistics characterized by the consolidation of goods from different manufacturers. Contrary, nanostores have no logistics support and ways to supply these stores are relatively inefficient [4]. Supply is characterized by fragmentation; small quantities and high replenishment leading to low vehicle fill rates (VFR) and increasing transportation costs. This is enforced by the fact that most manufacturers use exclusive distributors [5]. Altogether this leads to an increasing pressure on the feasibility of current supply models.

The combination of inefficient supply models and last mile transportation challenges might necessitate delivering these stores in a more tailored way through alternative delivery concepts. Concepts include the use of shared depots, modal shifts, crowdsourced deliveries and pick-up points [6]. There are two flaws this study aims to address. First, these concepts are mostly studied from a cost-efficiency perspective [7], [8]. Whether a concept is feasible also depends on the acceptance of the receiver. One therefore has to look at delivery preferences and to what extent a concept affects them. Second, although there is extensive literature on nanostores, its logistics and supply models are barely studied [9]. The research question is: *What are the main delivery preferences of nanostoreowners in a megacity environment in an emerging economy and how do they influence the applicability of alternative delivery concepts to supply nanostores more efficiently?*

The next section presents the methodology, followed by the results based on data collected in

Jakarta. Hereafter, the link between preferences and concepts is discussed.

2 Methodology

Delivery preferences are listed through literature (e.g., [10]). After a pre-selection, a list of 14 delivery preferences has been determined, based on discussions with experts involved in the supply of nanostores. A case study is performed in Jakarta (in Indonesia, there are an estimated 3 million nanostores, and in Jakarta 70% of the FMCG are sold in nanostores; [11]). Through a survey conducted with storeowners, the importance of the delivery preferences is validated (5-point Likert scale: 1 not important – 5 very important). Furthermore, questions on store characteristics (i.e., availability storage room) and delivery process are included. In total 56 respondents have been surveyed in different districts in Jakarta. The prerequisite is independency of the store – not belonging to a retail chain.

3 Results

The results show that the majority is being delivered by distributors. 50% of the stores is smaller than 20m^2. The average store size in Indonesia is 12m^2 [11]. Most storeowners (83.9%) order products through physical contact which is also reflected in the 80.4% that is not open to online order placement. According to Nielsen [11], stores in Indonesia generate on average 4.5 delivery trips per week. The survey shows that most stores are delivered once per week (31) and 26.4% is delivered more than once per week (some daily). The current system – ordering and receiving products – is by more than three quarters of the respondents considered to be convenient. The results show significance between storage space and delivery method (pick-up, delivery or both); stores without a storage space conduct more pick-ups and those with are being delivered more frequently. Furthermore, only a minor part of the storeowners is privately active online (25%). These storeowners are somewhat more open to ordering online than the ones that are not active online.
The table below shows that there are seven delivery preferences that are considered to be very important (green) by the nanostoreowners.

Table 1. Importance delivery preferences

Delivery preference	Mean	Standard deviation
Goods not damaged	4.98	0.137
Possibility to exchange/return	4.89	0.567
Pricing, availability of offers and promotion activities at supplier	4.82	0.796
Willingness supplier to respond to needs, problems and complaints	4.78	0.534
Delivery at store	4.69	0.920
Request express delivery service	4.47	1.012
Delivery lead time	4.47	0.912
Product variety at supplier	4.09	1.127
Payment method	4.05	1.394
Delivery within time window	3.68	1.529
Real time information about delivery	2.85	1.758
Delivery with less polluting vehicles	2.66	1.860
Products of different brands are bundled for delivery	2.55	1.659
Value added services in-store	2.42	1.622

Storeowners who pay on credit do not attach importance to real time information, whereas those who have to pay cash find this more important. They might anticipate on having cash available when they know when products arrive. The stores with a storage space attach less importance to bundling than the ones without (p-value 0.038).

4 Discussion

Several alternative delivery concepts influence the actual delivery and therefore delivery preferences have to be taken into account. For instance, when using an *urban consolidation centre* (UCC), products are being delivered bundled. This means that there are fewer stops at the store and shipments increase in size as well as in price. This is particularly relevant for small volumes that are delivered in a fragmented way (low VFR) [12]. In other cases, the actual delivery is not necessarily impacted; for instance, delivering with an electric instead of a conventional vehicle. Another promising concept is to use *pick-up points* such as lockers. Several storeowners already pick-up their products by going to a wholesaler, whereby they immediately acquire products. This is not the case when ordering products and having them delivered to a pick-up point. This clearly has an impact on ‘delivery lead time’. Pick-up points do also not comply with other major preferences, particularly the possibility to check whether products are damaged, the possibility to send them back and obviously ‘delivery at the store’. *Crowdsourced delivery* means that an individual takes the products along when making a trip [13]. Considering that the technology and the critical mass are present, it could be utilized to deliver fragmented volumes regularly. There is,

however, less contact with suppliers which affects the possibility to file complaints and send back products. At the same time, 'value-added services in-store' are not offered when individuals deliver, but these are also considered to be less important by storeowners.

When focusing on the link between delivery preferences and concepts, a distinction should be made between the 1) order placement (information); 2) payment method; and 3) physical delivery (three flows of the supply chain). In this respect the willingness as well as ability to pay/order online vis-à-vis physical delivery/pick-up should be further investigated. This is reflected in the results whereby storeowners find product variety important when ordering with a supplier, but they attach less importance to bundling during the actual delivery. Currently, the majority of the owners is neither open to online order placement nor payment. Interestingly, those who order online attach less importance to delivery lead time. Possibly they are accustomed to the discrepancy between ordering as well as paying prior to delivery. In this respect, future trends have to be taken into account in further analyses. On the one hand, technology – in particular the internet connectivity of the population – has to be considered. This share is currently only 28% in Indonesia, meaning that there is a high future potential [14]. As this increases as expected, ordering and paying online gets more common, whereas concepts such as crowdsourced deliveries become more viable. On the other hand, deliveries are expected to become more complicated, particularly in a highly congested city such as Jakarta. More stringent regulations might force to change deliveries anyway [3]. If all distributors start delivering differently (e.g., *off-hour deliveries*), storeowners eventually have to adapt and get accustomed to it. Delivery preferences, nonetheless can be taken into account to have a competitive advantage. Eventually this all relates to stakeholder behaviour with regard to ordering (by storeowners) as well as deliveries by suppliers.

5 Conclusion

A revision of supply models for small shipments towards nanostores in cities seems inevitable. Rather than focusing on the cost-efficiency of alternative delivery concepts, this study shows the importance of delivery preferences. The study provides ample opportunities for future research. First, a more in-depth analysis of the preferences by clustering them based on ordering-payment-delivery. Second, a focus on the behaviour of the different stakeholders involved in the supply – the shippers who want to secure sales, distributors who aim for low costs as well as satisfied customers, and the storeowners. Another interesting avenue is to use the delivery preferences as well as the attributes of the discussed and other concepts as input for further analyses (e.g., choice-based-conjoint (CBC) or a multi-actor multi-criteria analysis (MAMCA)).

References

[1] MDS Transmodal, "DG MOVE European Commission: Study on Urban Freight Transport," 2012.

[2] H. Quak, "Sustainability of Urban Freight Transport. Retail distribution and Local Regulations in Cities," Erasmus University Rotterdam, 2008.

[3] B. Kin, S. Verlinde, and C. Macharis, "Sustainable urban freight transport in megacities in emerging markets," *Sustain. Cities Soc.*, vol. 32, pp. 31–41, 2017.

[4] E. E. Blanco and J. C. Fransoo, "Reaching 50 million nanostores: retail distribution in emerging megacities," 2013.

[5] E. E. Blanco and J. Garza, "Multichannel Distribution Strategies in Latin America," in *4th World Conference on Production & Operations Management (P&OM)*, 2012, no. July.

[6] C. Macharis and B. Kin, "The 4 A's of sustainable city distribution: Innovative solutions and challenges ahead," *Int. J. Sustain. Transp.*, vol. 11, no. 2, pp. 59–71, 2017.

[7] M. Savelsbergh and T. Van Woensel, "City Logistics: Challenges and Opportunities," 2016.

[8] E. Taniguchi, "Concepts of city logistics for sustainable and liveable cities," in *Procedia - Social and Behavioral Sciences*, 2014, vol. 151, pp. 310–317.

[9] M. Frasquet, I. Gil, A. Mollá, and T. Vallet, "Research trends in retailing – a comparative approach: Spain-Europe-USA," *Int. J. Retail Distrib. Manag.*, vol. 30, no. 8, pp. 383–393, 2002.

[10] M. C. Chen, C. L. Hsu, C. M. Hsu, and Y. Y. Lee, "Ensuring the quality of e-shopping specialty foods through efficient logistics service," *Trends Food Sci. Technol.*, vol. 35, no. 1, pp. 69–82, 2014.

[11] Nielsen, "Maximising Traditions. The Shop. Shopper. Shopkeer," 2015.

[12] B. Kin, S. Verlinde, T. van Lier, and C. Macharis, "Is there life after subsidy for an urban consolidation centre? An investigation of the total costs and benefits of a privately-initiated concept," in *Transportation Research Procedia*, 2016, vol. 12, no. The 9th International Conference on City Logistics, pp. 357–369.

[13] H. Buldeo Rai, S. Verlinde, J. Merckx, and C. Macharis, "Is the Crowd an Opportunity for Sustainable City Logistics?," in *Logistics*

Research Network Conference, 2016.

[14] Nielsen, “The Future of Grocery. E-commerce, Digital Technology and Changing Shopping Preferences Around the World,” 2015.