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Challenges and Opportunities in 'Last Mile' Logistics for On-line Food Retail

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Abstract. Conventional approaches to logistics for food retail continue to be challenged by the rapid growth of on-line food retail. At the same time, '*last mile*' logistics optimization for on-line retail also face challenges as changing consumer expectations, habits and purchasing patterns intersect with the increasing density of urban environments. Numerous considerations are already in play around servicing of last mile logistics for on-line food retail including whether it is home delivery or pick-up; delivery is attended or not; and, whether the service is managed in-house or out-sourced to third party providers. Selecting the appropriate distribution and delivery channel is challenging with choices intimately related to the variety and price of products offered for sale (premium or discount) as well as the delivery times promoted to prospective customers. Beyond these pragmatic considerations, are also changing consumer expectations and preferences, innovations in new technology, provenance & traceability, seasonality and emerging reverse logistics issues linked to 'green' carbon miles considerations. This paper systematically explores these issues emerging in online food retail logistics.

1 Introduction

On-line retail has expanded very rapidly during the last decade. In many Western countries, the on-line retail market-share of conventional retailing has grown to be between 5-10 % of the total market. In on-line food retail according to *Food Processing* [1] while traditional grocery stores in US increased their turnover by 0,3% in 2014, eCommerce retailers increased their turnover by 13,5%. Traditional grocery stores still have the majority of sales with a turnover of US$547 billion in 2014 in contrast to US$24 billion for e-commerce initiatives. According to *Food Processing* [1] there will be fewer traditional grocery stores in the future, and many will be engage in as much Internet order fulfillment in terms of "click-and-collect" as browsing-the-aisles retail.

Companies can be fully, partially or not engaged in e-commerce. Firms that are entirely based on e-commerce are also often described as virtual (or 'pure-play') organisations. Click-and-mortar (or click-and-brick) means that organisations are partially engaged in electronic commerce but operate a physical store as well. Brick-and-mortar companies are not engaged in e-commerce at all [1]. In a response to the rapidly developing e-commerce market, many physical retailers started to use the internet as an extra channel to sell their products [2]. Moreover, a lot of pure-play on-line retailers are opening physical shops or collaborating with traditional retailers [3]. They are engaged in what is commonly referred to as 'multi-channel retail" that not

adfa, p. 1, 2011.
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only includes physical stores, but also other channels, including on-line stores and a range of different types of delivery options for end-customers [4]. Perhaps unsurprisingly, with the growing pervasiveness of mobile internet connectivity and increasing competition in the retail marketplace, most retailers are diversifying into these multi-channel forms of retail.

This multi-channel strategy attracts three segments of customers. The on-line channel attracts the type of customer that prefers to view product descriptions on-line and save travel and purchasing time. The physical store captures the loyal clients that prefer to shop in a store rather than on-line. While the availability of both channels has stimulated the emergence of a third segment of consumers that opt to use different channels at different times and thereby display multi-channel purchasing behaviors [5].

Newswire [6] conducted a small survey among 1250 consumers comparing physical and on-line retailers. For perishable goods, 67% of consumers surveyed indicated that physical shops outperform on-line retail, while only 5% indicated the reverse. In relation to product variety 38% of consumers surveyed favour physical shops, while 22% indicated favouring the reverse. These survey results highlight some of the issues emerging with the rapid growth of on-line retail including changing shopping habits, challenges in servicing variety and higher requirements for quality and trust.

In supermarkets there are many fresh food departments including bakery, butcher and grocery where perishability and personal preference are significant factors. For example, grocery items such as vegetables and fruits belong in the 'see/touch/smell' category. Consumers want to check that for example, the apples they pick have no bruises and/or if a melon feels firm. Consumers want to personally choose their own fruits and vergetables and pick and choose their bread and meat purchases. Clearly buying on-line creates a risk that the product received may not meet the expectations of the consumer. Furthermore , many consumers attach significant value to the 'shopping experience' that involves being helped by expert personnel during the purchase of fresh products. Another challenge to overcome is the lack of instant fulfilment with on-line shopping. New technology such as streaming media, that provide real-time visual information of these type of products, and chat possibilities with store employees may mitigate some aspects of this lack of instant fulfillment and contribute to a further increase in on-line shopping, although it is likely to be only one factor amongst many for consumers when opting to purchase on-line.

Another important challenge for on-line food retailers is developing a convenient and user friendly on-line environment where consumers can buy groceries quickly and easily. Following Babin et al, there are at least two types of on-line shopping behaviors exhibited by either 'utilitarian shoppers' or 'hedonic shoppers'. Utilitarian shoppers perceive shopping as work, they want to do it fast and have it done quickly and easily. Hedonic shoppers strive for fun and entertainment in shopping (Babin et al, 1994). As a result on-line retail needs to be able to service both types of shopping behaviors in its on-line retail environments ie. It has to support convenient and quick-to-use, as well as pleasant and enjoyable shopping experiences. To-date, the most innovative approaches to address these challenges has been the use of virtual reality and/or augmented reality to enhance interaction in on-line shopping environment in

response to on-line consumer behaviors and preferences Although it appears probable that choices about investment in these types of on-line experiences may be contingent on the volume of hedonic shoppers as opposed to utilitarian shoppers engaged through the on-line retail environment.

2 The last mile

Around 1950, about 50% of the European population was living in cities. Nowadays, this is more than 70% and according to the United Nations, this will rise to slightly over 80% by 2050 [7]. For logistics, cities are a challenging area. As a result of the high population in cities, demand for goods and services is high as is the density of buildings and the complexity of the public and private infrastructure [8]. Another source of the complexity of the urban environment rises from the great number of firms operating and delivering their products and services in a dense area with limited integration or coordination between them [9].

The last-mile refers to the last part of the physical goods delivery process. It contains the upstream logistic activities necessary for the delivery from the last transit point to the final destination of the retail chain. The urban last-mile in logistics and distribution systems is responsible for as much as 75% of the total supply chain costs [10]. For both retailers and manufacturers, the last-mile is becoming both more complex and of more strategic importance both from cost and sustainability perspectives.

In on-line food retail Fernie and Sparks [11] describe the challenges as follows: "They must typically pick an order comprising 60–80 items across three temperature regimes from a total range of 10–25,000 products within 12–24 hours for delivery to customers within one to two hour time-slots".

Inventory Management

Two major organizational models for inventory management that can be identified are: 1) store-picking and 2) warehouse-picking and drop-shipping. With store-picking the consumer places an order on-line and the information is sent to the nearest (or designated) store and an employee picks the ordered product from the shelves. This strategy is only operable in the case of a click-and-mortar retailer. Warehouse-picking has warehouses dedicated to internet orders. The internet orders are packaged in the warehouses and shipped out to the consumers. This form of inventory management necessitates investment in warehouses and lead times can be long, because of the single, centralized, warehouse [12].

Delivery Options.

To support maintenance of customer loyalty, trust and satisfaction, after-sales and support services are key issues with physical delivery (and returns) have a critical role. The last mile is the critical part of the delivery of Internet orders of consumers. Generally, it is considered the most important part of the order fulfilment process [13]. This is especially so, given the remarks above about consumer satisfaction, trust and loyalty that are mainly instantiated during the last part of the delivery process.

Last mile delivery can take place in two ways, through home delivery and through pick-up points. Both strategies have their own challenges.

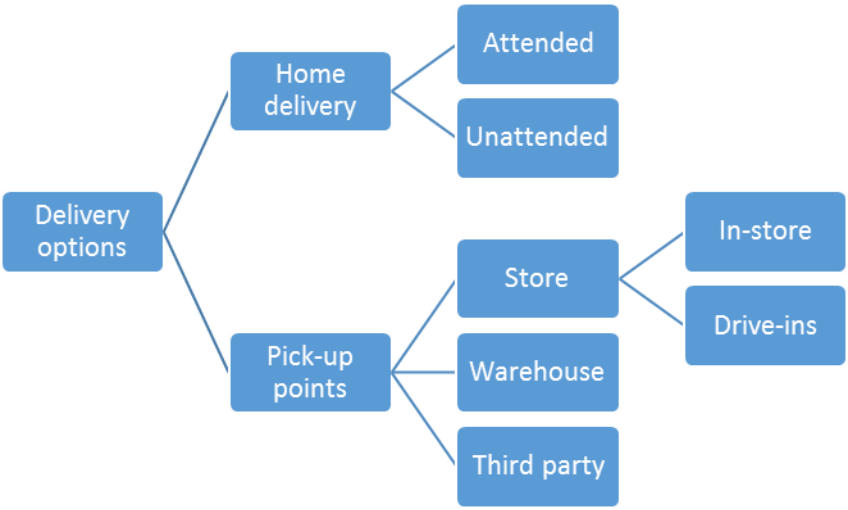

Fig. 1. On-line delivery options (Kooijman, 2014)

In the case of home delivery, the delivery time slot is very important if the order is directly delivered to the consumer (attended home delivery). Other options are putting the order in a box nearby the consumer's home and leaving the consumer to pick it up, or by leaving the box of goods at the consumer's house (unattended home delivery). It is evident that the costs increase with the more choice available to the consumer when selecting the home delivery time window. This is primarily because with smaller time windows the delivery truck needs to drive back and forth in the service area to meet the promised delivery times. The average number of orders per route will be lower with a smaller delivery time window. Other typical challenges of home delivery include the order comprising different items requiring different temperature regimes; the extra costs (for consumers and/or retailers/logistics providers) from the provision of facilities like a cool box at the consumer's premise in case of unattended delivery, and the management of delivery time slots in case of attended delivery. Periodic home deliveries of (unspecified) products such vegetables or fish. may enable retailers to balance their sales and supply better than the retailers based on ad-hoc sales. But consideration also has to be given to reverse logistics (returns) of products that do not meet customer expectations or alternative sales responses such as discounts or rewards for future orders when deliveries do not meet consumer expectations.

Pick-up points have developed as an alternative to home delivery. Pick-up points are locations to collect items ordered on-line. The most frequent type of pick-up point is the parcel service point, a staffed point that can be found in supermarkets and stores. Alternatively, unstaffed pick-up points exist, as for instance via secure lockers. Delivering at a pick-up point may give the consumer more flexibility. Once delivered,

the consumer can collect the product whenever suits them. In the Netherlands, the number of pick-up points has increased from 900 in 2006, to about 2500 in 2013.

The use of pick-up points is often free of charge, or cheaper than the delivery fee. This may make the option to collect the order at a pick-up point more attractive for consumers. For businesses, delivering to a pick-up point is often cheaper than home delivery, because orders can be consolidated [14]. On-line retailers as well as third-party logistics operate pick-up points in the Netherlands. Bol.com, for instance, cooperates with Albert Heijn and offers pick-up points in their supermarkets [15]. DHL, a 3PL provider, deploys more than 1300 pick-up points in different stores in the Netherlands (DHL, n.d.). Ultimately, the balance that will emerge between home delivery and pick-up points is intimately related to how changing consumer expectations, habits and purchasing patterns intersect with the increasing density of urban environments. The experiences in the Netherlands may not be easily transferable to other urban contexts.

3 Logistics challenges of online retail

We distinguish the following key business challenges.

Process design in multi-channel solutions

The fulfilment of on-line orders differs from the traditional channel. This is particularly challenging for a brick and click retailers. In the on-line channel, packages tend to be small for single-orders. Delivery to a physical store, mostly includes larger packages, containing multiple identical products [3]. Firms need to decide which processes to separate for both channels, providing the optimal processing for each, and what processes to combine, to find a compromise between efficiency and costs.

Assortments and cost effectiveness in pure play solutions

The challenge of using the pure-play method is to acquire enough sales to get at least break-even. To be cost-effective, dedicated picking centres must handle a large throughput. In the early stage of on-line grocery retailing, when the sales volumes are still low, it is costly to offer an extensive range of products. An on-line grocer can choose to offer a limited range of products, but this will make it more difficult to lure consumers from traditional grocery shopping. Another problem using the pure-play method is that dedicated picking centres encounter difficulties with the disposal of excess stocks of short shelf-life products .

Order Picking.

With the growth of the B2C, the amount of small lot-size and dynamic arrival of customer orders has increased tremendously, making order picking and delivery with short lead times more important [16]. To make this possible, flexible and timely warehousing is needed. However, the great number of small orders and irregular items makes this more complex. Warehouses need to lower the processing times, while offering great service [16].

Technology challenges.

The growing trend of using wireless devices, such as laptops, tablets and mobile phones, for electronic transactions, is also known as m-commerce or mobile e-commerce. With the wide-spread use of this mobile technology, customers are able to shop wherever they are and whenever they want, through an electronic commerce platform [17]. Regarding delivery technologies, large players like amazon.com are investigating the use of drones for grocery deliveries.

Returns.

The growth of E-commerce has led to a new problem: the large volume of customer returns . This problem is especially present in product categories where the 'touch and feel' element is important to determine if a product is suitable, for instance the clothing category or fresh food products. The relevant attributes for consumer decision making for such products are difficult to communicate on-line . Janakiraman, Syrdal & Freling [18] discuss different ways of return policies and conclude that time, scope and exchange policies are most suitable to reduce returns. Return policies will receive increasing attention while our production and waste economy makes its change to a ''circular'' economy.

4 Discussion and Conclusion

A large number of issues related on on-line retail has been discussed with a main focus on channels and (last mile) deliveries. The elements are summarized in figure 2.

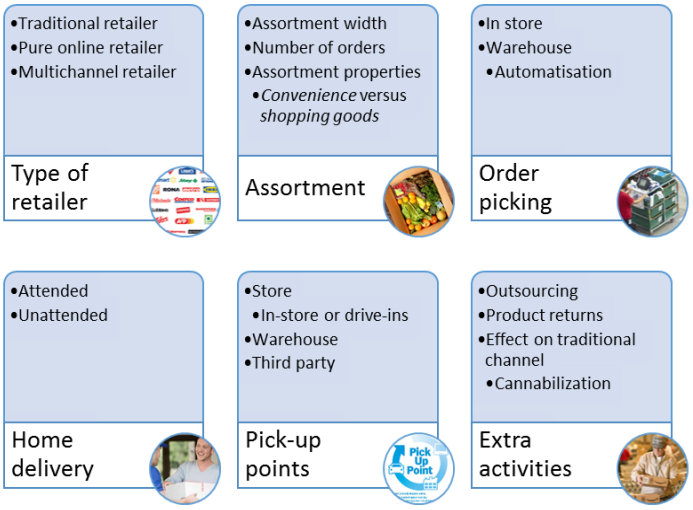

Fig. 2. Overview of logistics aspects of on-line retail

With the physical retailers move towards multi-channel and on-line sales the on-line retail is expected to grow even faster in the coming years. Some of the major challenges being the last mile of delivery and product returns whereas some of the

options may be to enable innovative information systems and a higher degree of customization.

Innovative information systems may include consolidation of individual orders enabling different functions in the supply/demand chain from order to delivery. Customization has, alongside quality and price, been the main competitive advantages in manufacturing over the last 30 years. In a retail perspective this may involve customized packing of fruit and vegetables or supply of ingredients for full meals customized for special needs (diet, intolerance etc).

To level the resources in the warehouse a detailed analysis of POS data could be used to identify the position of the customer order decoupling point and thereby enabling prepacking combinations of products that are likely to be sold.

Finally, many companies will consider outsourcing of functions to new players in the supply chain. Indeed, transaction costs in on-line retailing can be exceptionally high. Outsourcing to specialized (logistics) service providers may bring down these transaction costs [2]. In this regards, web-only retailers will outsource to a bigger extent than multi-channel retailers [2]. Apart from outsourcing of picking and delivery and return management, also functions like customer management and web ordering could be functions to be outsourced to specific service providers, making these into ‘’infomediaries’’. This would be in line with general developments in outsourcing where 3PL providers develop into 4PL providers offering a wider range of logistics and management services to their customers.

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