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Home delivery services: innovations and emerging needs

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Abstract: The increasing amount of small-sized shipments and their frequency variation, due to the growth of e-commerce, pose a great challenge to logistics service providers. At the same time, new technologies and innovations are being developed with the aim of increasing the efficiency of logistics service provider, as much as foster the creation of new enterprises and business models in the home delivery sector. The aim of this paper is to provide an exploratory analysis of the fit between existing home delivery innovative services, requirements, and issues that users might have. To do so, we review the main features of innovative services and we compare them with the findings from an online survey. For each service, we identify the value propositions, and the issues the service aims to address. In particular, four innovative services are reviewed. Through the online survey, we identify user's habits, requirements and perceptions regarding the effectiveness and features of the innovative services.

Keywords: Transportation science; Smart transportation; Home Delivery; Innovation; Survey.

1. INTRODUCTION

Demand for small package home delivery services has rapidly increased in recent years, largely due to the growth of online shopping. Moreover, Huang et al. (2008) claim that the quality of logistics service performance is an important key marketing component that helps create customer satisfaction, consequently, the increasing number of small-sized shipments and their frequency variation pose a great challenge to logistics service providers. They need to rationalise the cost of operating and maintaining their parcel distribution networks, achieving, at the same time, a reasonable success rate of on-time delivery of packages across a large geographic area in order to satisfy the user needs.

At the same time, new technologies and innovations are being developed with the aim of increasing the efficiency of logistics service provider (e.g. Hwang et al. (2006) propose a digital home service delivery system for small business companies). Innovations in this field support the efficient operations of large companies, as much as foster the creation of new enterprises and business models in the home delivery sector.

The aim of this paper is to provide an exploratory analysis of the fit between existing home delivery innovative services and requirements and issues that users are experiencing. To do so, we review the main features of innovative services and we compare them with the findings from an online survey. This paper presents the first findings from a larger project on the development of a new home delivery service.

The paper is structured as follows: Section 2 consists of the analyses of existing related works, Section 3 describes the methodology applied in this paper, Section 4 presents existing innovations in home delivery, Section 5 describes survey results and Section 6 concludes the paper with some considerations and future works.

2. THE CONTEXT OF HOME DELIVERY

Home delivery has been treated and has attracted the interest of both academies and industries for some decades: the first patent we found about "a method and apparatus for validating credit information during home delivery of orders" (1993) was registered in 1991 by Jerry R. Martinez. Instead, in the academic world, Cairns S. (1996) published a paper exploring the experience of providing home delivery services for groceries at that moment. The study involved 58 companies, operating in 9 countries, exploring the practical and economic dimensions of providing services, predictions of likely future patronage, and the factors that may be conducive to successfully introducing new initiatives. Furthermore, Alba J. et al. (1997) examine the implications of electronic shopping for consumers, retailers, and manufacturers assuming that near-term technological developments

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would have offered consumers unparalleled opportunities to locate and compare product offerings.

Since then the research in this field has never stopped and in the next decades, the home delivery concept has been studied by two different point of view: the seller and the consumer point of view. Even though both of them have been studied by researchers all over the world, there is a difference between them: a lot of works were founded in literature about the seller point of view, instead only a few papers were found related to the consumer one.

Punakivi M, for example, published (2001) a paper identifying the success factors in e- grocery home delivery and comparing new services offered by service providers in the United States. In their paper, they compare 2 different delivery services, the so called "reception box" and the "time window" services, looking at differences in cost structures and providing guidelines for the future development of the e- grocery home delivery services. Furthermore, Weigel D. et al. (1999) present a series of algorithms related to vehicle-routing-and-scheduling system aims at improving the Sears technician-dispatching and home-delivery business. In addition, Morganti et al. (2014), study the deployment of pickup point networks in urban and suburban areas focusing on the strategy of network operators. They identify main variables and constraints that could affect the development of pickup points, such as the size of the "catchment area", the technological platform used to manage the PP network and the availability of shop owners to use and join the network.

On the other hand, the consumers point of view were treated only by a few papers focusing on the issues of service quality in home delivery and consumers' behavior, so, the focus of this project is to investigate the growing customer needs for innovative home delivery services.

One of the papers that investigate the customer's needs and behaviors is the one published by Chen et al. 2012, using the Quality Function Deployment (QFD) tool in order to investigate a new service development for a home delivery service of specialty foods in traditional market (Chen et al. 2012). Results show that customers put emphasis on the security of personal information and trading mechanism, as well as to the speed of delivery service, and the quick response from the company when problems occur. Finally, Morganosky M. A. et al. (2000) report a preliminary assessment of consumer response to and demand for online food retail channels. Data were collected from 243 US consumers who expressed their opinion about online grocery shopping: delivery is one of the most considered factor that they used as meter in their evaluation, so it is important to understand real user needs about it and this is exactly what we will do in this work.

3. METHODOLOGY

The first step in identifying innovative services, requirements and issues experienced by users was performed by reviewing of existing innovative home delivery services. To this aim, four different services are reviewed and the value proposition and the issues that the service aims to solve are identified

After that, we conducted an online survey using a Google form to investigate habits, requirements and perception regarding the effectiveness and features of the innovative services. A community of scholars and students of the Politecnico di Torino was involved in the study. The survey has been online and accessible since November 2015 and it consists of 21 questions divided into four main sections of demographic, online-shopping issues, user's habits regarding online-shopping and their perception regarding innovative delivery services. A total of 562 responses were received.

Finally, discussions and conclusions are drawn comparing the results of the survey with the main characteristics and value propositions of considered innovative services. Those help us to evaluate qualitatively their potential for meeting users' requirements and address existing issues and emerging needs.

3.1. Survey structure and data analysis

In the first section we asked about their age, job and educational level in order to have a detailed description about our sample's characteristics. In the next section we examined if they purchase any goods online, with which frequency and what is the amount of money they usually spend for these purchases per year. In this section we also asked the reasons they do or do not purchase online and what are the important factors that drive them to shop online. In the following sections the questions about their current habits about online-shopping were posed. For example the place at which they usually receive the goods and the delivery mode that they would prefer. The last section dealt about some innovative delivery services' awareness among the respondents. In particular, we asked to indicate the most significant characteristics of the service, choosing among economically accessible, eco-sustainability, flexibility to choose among different delivery destinations and times, reliability, simplicity to use and having trustful relation with courier.

Descriptive statistics was used for the survey data analysis. In order to compare the answers given on different factors on a Likert scale between 1 and 5, we used median values for the tendency and quantiles for dispersion (when applicable).

4. INNOVATIONS IN HOME DELIVERY

Among innovative services for home delivery we found the use of automated pack stations (APS), which are increasingly being adopted by carriers and logistics service

providers. This solution consists of a network of location in which companies install locker boxes, in which parcels are retained until the customer is able to pick them up; the customer then picks the parcel by using the order reference code. Usually, public places such as markets, universities, train stations or post offices are selected as preferred location. This option reduces the time spent for the daily routes of delivery trucks, since carriers do not have to deliver parcels to individual customer's home but aggregate delivery to one point. Moreover, investment costs of installing and maintaining locker banks are offset by savings, because leaving more packages at a time at drop-off points, means that companies can split the cost of each delivery over many shipping fees[1]. Basically, all the main logistics service providers are implementing this solution. For instance, DHL started installing lockers in Germany in 2001, and has installed 2,700 locker banks, mostly in train stations, since then. Alongside the main players in the delivery sector, some companies are now specialized in installing and managing automated pickup points world. ByBox is a UK based company who operates 18,000 electronic lockers through its subsidiary Logibag, to offer an overnight distribution service for spare parts; the same service has been implemented in Paris by an elevator manufacturer (Sugar, 2010; Janjevic et al., 2013).

Similarly to the previous service, many logistics companies have established a network of local stores that act as pickup points to store their customers' items. Morganti et al. (2014) provide a comprehensive overview on existing networks and main features of this delivery service. This solution may generate positive benefits for all stakeholders involved. Shop owners who participate in the programme are looking for both extra revenues and additional in-store traffic; customers have larger time windows to pick up their items (although the service is not available 24 hrs/day since it has to conform to opening hours); finally, logistics service providers gain operational benefits in terms of decrease in missed delivery and increase in goods consolidation. As in the case of automated pick up points, new companies specialized in last mile delivery through a network of pick up points are emerging. Companies such as Colis Relais and MondialRelay in France or CollectPlus in UK, operate networks of up to 5000 pickup points, and basically provide an additional delivery solution to customers that buy items online[2]. In this sense, they are competitors of larger logistics service providers (e.g. DHL, TNT) which also established their own network of pickup points. Moreover, customers can send their parcels from the stores participating in the network.

Since Smartphones are widely used,a new type of service has emerged in recent years, denominated crowd delivery. Smartphone apps such as Deliv and CrowdToGo allow private citizens to use their own car to deliver packages in exchange for a fee. When an item is purchased by the customer, a driver receives a notification and agrees to deliver the item to the customers' requests, which comprise a selected time window. In addition to traditional online shopping delivery service, crowd delivery platform offers local retailers a cheaper option for sending items bought in-store by their customers[3]. Thanks to these services private citizens are able to earn an extra-income, and the level of service increases, since customers receive same day delivery at the same price of the standard delivery. Although crowd delivery is still in its infancy, consolidated companies like Amazon are considering crowd delivery to expand their offering[4].

Finally, logistics service providers such as FedEx and DHL have integrated in their delivery system more sophisticated delivery tracking services, thanks to the use of multi-sensory device deeply integrated in the packages. Softwares such as SenseAware and iAccuTrace supply an interactive interface that lets users know where their parcels are in that specific moment. The interface is typically a website on which a user tap her tracking number and the system lists the places in which the item had passed since that moment. Moreover, they provide real-time access to a wide range of statistics on the customer's' shipments.

5. SURVEY RESULTS

5.1. Survey Participants Composition

A population of 562 people was involved in the study, with 298 males, 260 females and 4 people that did not declared their gender. Most of participants were aged in the interval "25 - 35" (Figure 1).

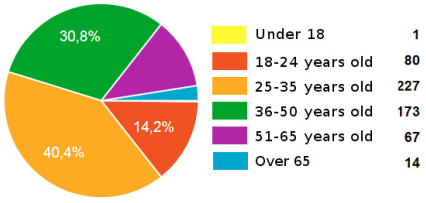

Fig. 1. Age of respondents

Figure 2 illustrates that most interviewed people has at least the basic education and Figure 3 shows their employment.

[1] http://www.wsj.com/articles/parcel-delivery-firms-and-retailers-experiment-with-package-pickup-points-1431966679

[2] Information retrieved from companies' websites

[3] http://www.deliv.co/local-retailers/

[4] http://fortune.com/2015/06/16/amazon-crowd-source/

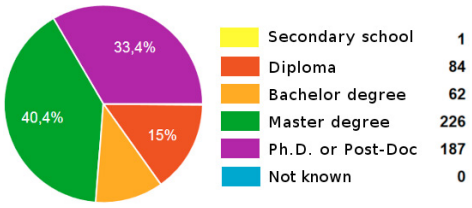

Fig. 2. Education of respondents

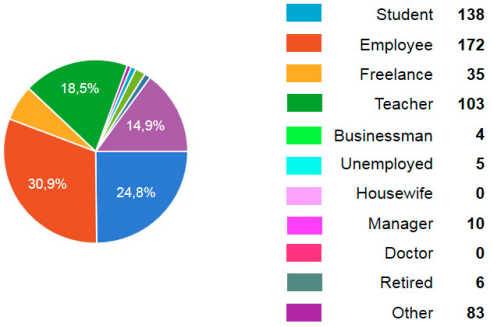

Fig. 3. Employment of respondents

5.2 Participants' habits and behaviors

We asked our respondents about the frequency and total purchases of their online shopping. We investigated different categories of goods divided in Clothing, Food/Beverage, Leisure, Electronics, Editorial, Health/Cosmetics and Insurance. Frequency was measured with 4 categories: Never, between 1-4 times/year, between 5-10 times/year and more than 10 times/year; the total expenditure was measured with 5 categories: less than 50€/year, between 50€ and 200€ /year, between 200€ and 500€/year, between 500€ and 1000€/year and more than 1000€/year. In order to check the data consistency, a further category 0 €/year has been added. In this way, if a respondent answered that never purchases a type of product online and later stated that spends more than 0€ for that particular category it was possible to rule out an inconsistent response.

Results show that the participants buy from 1 to 4 times per year *Clothing, Electronics* and *Editorial* products, and from 5-10 times per year products pertaining to the *Leisure* category. For the remaining categories, the median value is equal to no purchases at all. To compare the results on the amount of money spent per category per year, we perform the analysis only on values higher than 0 €. The median values for *Clothing, Food/Beverage, Furniture, Editorial* and *Health/Cosmetics* is equal to 50-200 €/year. Respondents seem to spend more (200-500 €/year) for *Electronics, Leisure* and *Insurance* products. Interquartile range (IQR) measures the data dispersion, and it is highest for Leisure purchases. In fact, the range between quartile 3 and quartile 1 is equal to two categories: 500-1000 €/year and 50-200 €/year.

Regarding the perceived issues and features of the shopping online experience, we asked about why do and do not they purchase online. The most important factor that drives our participants to purchase online is the cost value. 69% has answered that they purchase online because the products are cheaper in online stores comparing with traditional stores, while 81% has stated that lack of trust is the most important factor that prevents them to shopping online.

5.2 Factors regarding home delivery services

Respondents were asked to state their opinion on the most important factors that might characterize a good delivery service. First of all, they stated on a Likert scale 1-5 their preference on some selected features, namely i) fast delivery, ii) service quality, iii) possibility to choose delivery time, iv) possibility to choose delivery location, v) price, vi) possibility to choose different kinds of packaging, vii) eco-sustainability of the delivery and finally viii) real-time tracking of the delivery. Figure 4 shows the results: the most important factors are the service quality, the possibility to choose delivery time and location (median value = 5) and the least important are the possibility to choose from different packaging options (median value = 2) and eco-sustainability (median value =3).

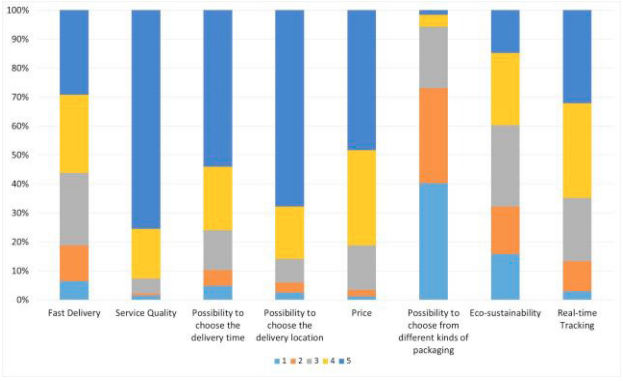

Fig. 4. Preferred characteristics of a home delivery service

Surprisingly, price is less valued than other features, and answers to the next question further deepen this controversial statement.

A control question was submitted, in the form of stated preferences between some proposed tradeoff in terms of cost-time, cost-quality and cost-safety of the delivery. Results show that, even if price had been valued less than the possibility of choosing the delivery time, the vast majority of respondents would not prefer to pay a higher price for this feature, but rather have a slower delivery free

of charge (Figure 5). We argue that this seemingly paradoxical statement derives from the very nature of this control questions, through which the respondents are confronted with a trade-off they have never experienced, and therefore might not be able to evaluate i.e. pay a higher delivery cost for additional service such as the insurance or the possibility of choice of delivery time.

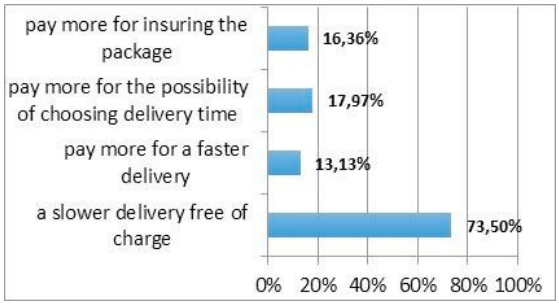

Fig. 5. Respondents' preference over selected tradeoffs

5.3 Perceived services' value propositions

During the analysis of the innovative delivery services, we investigated the most important value propositions perceived by users. On the basis of this analysis we found out how many users had already used the following services: tracking mail and deliveries (47%), delivery to pickup points (33%), crowd-delivery (4%) and delivery to automated pack station (APS) (16%). Figure 6 illustrates this distribution.

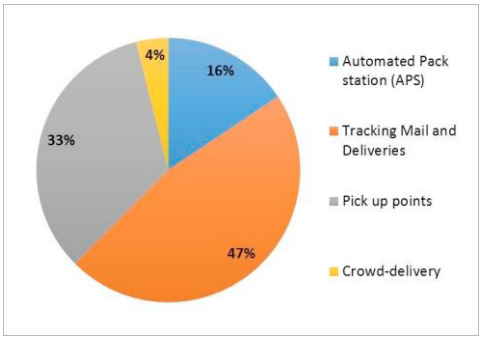

Figure 6 - Delivery services used by participants

The participants who have already used at least one of the innovative delivery services, were asked to asses the delivery services based on their experience. In particular, they were asked to assign at least one preferred value proposition that characterize these services among the following: *1- Economically Accessible, 2- Eco-sustainability, 3- Flexibility on choosing delivery destination, 4- Simplicity to use, 5- Reliability* and *6- Trustful relation with courier.*

Some of the value proposition for an innovative service have been already mentioned, namely *Economically accessible*, *Flexibility on choosing delivery destination and time* and *Eco-sustainability*. Other value propositions have to be clarified. *Simplicity to use* is intended as the user-friendliness of the service, whether the use phase of the service is well explicated in order to avoid the user confusion; *Reliability* means the ability to be relied on the accuracy, and quality of the delivery service, avoiding to receive broken packages or goods. Finally, a service may be able to provide a *Trustful Relation with Courier* by establishing direct relation between the user and the courier.

All participants of the survey, gave the highest value for Economically Accessible (100%) to all four services. The Flexibility on choosing delivery destination and time is the second factor ranked after the Economically Accessible, being valuated by 80% of our respondents for the Automated Pack station and crowd-delivery services; 72% for Delivery to pickup points and 68% for Tracking mail and deliveries. Eco-sustainability instead showed the higher value for the Crowd delivery service. Finally, Crowd-delivery is rated as the most eco-sustainable and flexible service, while the delivery to pickup points is rated as the most simple and user-friendly service. The most reliable service is the Tracking Mail and Deliveries.

We can conclude this part of analysis assuming that economic accessibility is perceived from end-users as the most important value proposition for an innovative delivery service.We employ that this is due to the lack of enough knowledge regarding other values that an innovative service can offer to the user.

6. CONCLUSIONS

This study explored the relationship between what the existing innovative home delivery services can offer and the end-user's requirements and issues regarding home delivery service. A state of the art of four services is presented.Logistics service providers find the Automated pack stations as a feasible option in terms of goods consolidation, and the reduction of issues of deliveries when end-users are not at home at the time of the delivery. he delivery to pickup point, may have the same advantages,which is a solution that may generate positive benefits for other stakeholders involved, such as shop owners looking for extra revenues and additional in-store traffic. Crowd delivery services allow private citizens to use their own car to deliver packages in exchange for a fee, and can potentially increase the level of service, since customers may receive same day delivery at the same price of the standard delivery. Finally, real time tracking provide real-time access to a wide range of statistics on the customer's' shipments, increasing safety of the package and reliability.

From the results of a survey that was submitted to the academic community of the Politecnico di Torino we were

able to draw some insights on their habits and issues regarding home deliveries.

When looking for a home delivery service, users stated that they look for the possibility of choosing date and time of delivery and the service quality. However, a controversial behavior was detected through subsequent questions. In fact, when confronted with three tradeoffs (i.e. between cost-time, cost-reliability and cost-flexibility of the delivery), respondents opted for a slower delivery free of charge rather than a higher, more reliable and flexible delivery.We assume that users answered in this manner because they have never experienced a trade-off between cost and quality of a delivery service (for example the safety and the possibility to choose delivery date, time and destination in a more flexible way.

Concerning the awareness and perception of existing innovative services, respondents have used mostly the real-time tracking service and the delivery to pickup points, and rated "economically accessible" as the most characterizing value proposition for all services. The second most rated value proposition is "Flexibility on choosing delivery destination and time".

Based on these preliminary results, it can be assumed that existing innovative services can leverage on the fact that users perceive them as low cost, and this is the most important feature chosen by users regarding a home delivery service. Moreover, these services can also fulfill another need expressed by users on the flexibility of destination and time of delivery. However, it seems unclear whether users would be willing to spend more in order to get this option or have a higher quality of service.

This study has of course some limitations, regarding mainly the composition of the sample and the statistics used for the analysis. Further, this research is useful towards the development of participatory methods in order to understand the participant's behaviors that this study might not be able to show, and furthermore to understand user's needs and desires regarding innovative delivery services.

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