Investigating last food mile deliveries: A case study approach to identify needs of food delivery demand

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Abstract

Drawing on the results of a survey carried out in Cagliari (Italy), the paper provides an analysis of the characteristics of food deliveries in urban areas aimed at understanding the needs and expectations of receivers of last mile deliveries of fresh products. In fact, exploring the needs of potential users - who are directly responsible for the success of the scheme - and the characteristics of logistics flows they generate/attract in the city centre is a necessary prerequisite for implementing city logistics measures. The study considers independent retailers within the hotel, restaurants and catering (Ho.Re.Ca.) sector. Based on the delivery characteristics, a classification of commercial activities related to the food chain is provided. The analysis has been developed by means of Multiple Correspondence Analysis (MCA) and Cluster analysis. The suitability of city logistics measures to the last food mile is also discussed.

1. Introduction

Nowadays, urban transport represents a challenging issue for policy makers (Witkowski and Kiba-Janiak 2014). The design of an efficient system that ensures the movement of both people and freight is essential for ensuring high quality of life in a city and its competitiveness with respect to the other cities (Witkowski and Kiba-Janiak 2012). However, the growing number of freight vehicles in cities contributes to congestion, air and noise pollution, as well as to logistics costs, resulting in increased product prices. Minimising these negative impacts of freight transport in urban areas and optimising urban freight flow efficiency is the main purpose of city logistics (Stathopoulos, Valeri, & Marcucci, 2012). The analysis of the mode of operation of transport and distribution of goods in urban areas is complicated due to the lack of data on their implementation. This is particularly true of the classification of freight flows, which depends on transport demand characteristics (Kijewska & Iwan, 2016). The reason for this is that private transport companies are not willing to share data on the services they provide, as they do not want to disclose information to the public sector and to other competitors (Taniguchi, Thompson, Yamada, & Van Duin, 2001). Another reason is the lack of standardised study methods in urban freight transport. According to Stathopoulos et al. (2012), the identification of the main urban freight distribution problems and the analysis of possible solutions for the different stakeholders, represent the first step in the design of a successful city logistics scheme. However, policies aimed at goods receivers are not widely studied. Moreover, little is known of receivers’ behaviour with respect to policy measures. This is the reason why the authors decided to study the characteristics of delivery flows in order to provide a classification of the receivers’ ‘delivery behaviour’. Many authors have pointed out that the majority of city logistics projects concern the delivery of non-food (Allen, Browne, Woodburn, & Leonardi, 2012; Arvidsson & Browne, 2013; Gonzalez-Feliu & Morana, 2010; Morana,
Gonzalez-Feliu, & Semet, 2014) rather than fresh products. According to Morganti and Gonzalez-Feliu (2015) this is likely due to cold chain constraints in the food supply chain, which entail: (i) greater difficulties and (ii) higher costs for logistics and delivery activities. Also, the large number of stakeholders (both suppliers and receivers) involved in the food supply chain makes the coordination of urban transport operations harder.

In light of the above considerations, the paper examines the results of a survey of last mile deliveries of food products carried out in the city centre of Cagliari (Italy). Analysis of the current delivery flows in Cagliari revealed the needs of receivers for identifying the characteristics and constraints of last mile deliveries. The surveyed area includes a significant number of activities in the Ho.Re.Ca. sector (i.e. hotels, restaurants, and cafés), mini-markets and take-away businesses. The authors consider the ‘food mile’ which can be defined as: “the physical distribution of food occurring in the last part of the food supply chain” (Morganti, 2011) and is usually characterised by small deliveries handled by transport operators, suppliers, wholesalers, distributors, as well as by receivers themselves (Morganti & Gonzalez-Feliu, 2015). The authors decided to investigate the characteristics of food deliveries received by independent retailers and the Ho.Re.Ca. sector, which represent about the 37% of the food products delivered in the urban area and which are the most critical for logistics efficiency (Morganti, 2011). The Ho.Re.Ca. sector includes points that are not simply commercial points, but “leisure” points. So, deliveries related to this sector, cannot be avoided. For this reason, the authors decided to investigate the characteristics of the demand associated to last food mile deliveries, in order to highlight the related needs. Morganti (2011) defines “last food mile” as the physical distribution of food to urban outlets. In fact, even though last food mile deliveries cannot be avoided (such as deliveries related to other categories of products — i.e. online shopping and home-deliveries, e-commerce), they can be reduced by implementing some traditional sustainable measures (e.g. time windows, pick-up points, etc.) able to improve the efficiency of the urban goods delivery system. Based on this concept, the main objective of the analysis is to address the following research questions:

1. What are the characteristics of a typical food delivery (e.g. frequency, time, size, supply mode, etc.) and what kind of needs do last mile deliveries in the food chain have?
2. What kind of relationship exists among the variables characterising food deliveries?

The paper is organized as follows. Section 1 provides an introduction to the problem and explains the reasons of the research work presented in this paper. Section 2 describes the state of the art in the field of last food mile deliveries. It provides an analysis on the point of view of the different stakeholders involved and on relationship between city logistics measures and the Ho.Re.Ca. sector. Section 3 describes the methodology applied to the research work, by describing the techniques used for data collection (section 3.1) and data analysis (section 3.2). Section 4 provides the description and discussion of the results of the survey. A comparison of the results achieved with those existing in the literature is provided. Section 5 concerns the description of data analysis, which includes the application of Multiple Correspondence Analysis (MCA) and Cluster analysis. The paper finishes with the section of the conclusion, which considers characteristics of last food mile demand and the suitability of city logistics measures to this sector.

2. State of the art

At the beginning, the studies carried out with the aim to investigate on urban freight flows, considered variables related to the characteristics of the surveyed shops (e.g. floor space, number of employees, etc.) (Allen, Browne, Cherrett, & McLeod, 2008). These studies did not find out significant results, probably because the urban delivery system also depends on other factors. Later, a study carried out in 2004 in Ealing (London), indicated that the number of vehicles attracted by cafés and restaurants was higher than for other types of non-food related commercial activities (Browne and Allen, 2006). Allen, Anderson, Browne, and Jones (2000) found that the type of product delivered is one of the factors influencing average dwell time (it ranges from 8 to 34 min), which is longer for restaurants and hotels than for other types of establishment that do not receive food products. Also, the study carried out by Kijewska and Iwan (2016), indicated that food deliveries are characterised by high frequency (daily deliveries, with their own vehicles and using third party transport), often using small old diesel vehicles, which are able to transit on any streets in the city centre. However, these vehicles generate higher pollutant emissions than their petrol counterparts, so food deliveries are potentially more pollutant. For this reason, sustainable measures able to reduce the negative externalities, such as urban freight consolidation centres (UCCs), related to last food mile deliveries are needed. However, UCCs are not usually used for food products and there are no many studies related to this sector. Probably one of the few that related to the evaluation of the UDC of Parma (Italy), carried out by Morganti and Gonzalez-Feliu (2015). In fact, the case of Parma is probably one of the few successful examples of food consolidation centres and the only one in Europe (Morganti & Gonzalez-Feliu, 2015). Nevertheless, deliveries of fresh food products represent a significant proportion of urban freight transport. In particular, probably due to the high requirements in terms of both delivery frequency and time, the Ho.Re.Ca. sector is considered the most difficult segment to coordinate and change (Morganti & Gonzalez-Feliu, 2015). Also, because of the cold chain and of the need for food preservation, costs for the delivery of fresh food to the Ho.Re.Ca sector are very high. This, together with the shortage of available space for refrigerated platforms makes such city logistics schemes extremely difficult to implement (Morganti & Gonzalez-Feliu, 2015).

Nevertheless, due to the poor consolidation of fresh products compared to the deliveries of other types of goods, improved logistics could potentially generate major benefits. According to Morganti and Gonzalez-Feliu (2015), the main obstacles to the success of the application of these schemes to the Ho.Re.Ca sector are:

1. Delivery size (small) and frequency (high);
2. Organization of the network (a large number of receivers spread throughout the city);
3. Complexity of logistics activities (carried out by wholesalers, suppliers and shopkeepers).

Another important obstacle to the implementation of city logistics measures has been attributed to the complexity of the urban environment, characterised by stakeholders with different needs and expectations (Kiba-Janiak & Cheba, 2011; Taniguchi & Tamagawa, 2005; Tseng, Yue, & Taylor, 2005; Witkowski, 2011). In fact, city logistics measures are not easy to implement by local authorities and readily accepted by stakeholders (Stathopoulos et al., 2012). For this reason, the implementation of city logistics policies cannot be successful without an understanding of the interests of the different stakeholders involved (Puckett, 2009). A review of city logistics policies and measures applied in the urban area should be carried out starting from the identification of the key stakeholders (Lidasan, 2011). They are: service providers (i.e. freight carriers), shippers, local authorities (i.e. administrators), receivers and end consumers (Papoutsis & Nathanail, 2016); (Taniguchi & Tamagawa, 2005). Their objectives can be
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