Urban Distribution Centers: doomed to fail or optimal solutions for last mile deliveries?

Alexandra Lagorio*+, Roberto Pinto*+, Ruggero Golini*

*Department of Management, Information and Industrial Engineering, University of Bergamo, via G. Marconi, 24044, Dalmine (BG) – Italy (roberto.pinto@unibg.it , ruggero.golini@unibg.it)

+ CELS, Research Group on Industrial Engineering, Logistics and Service Management, University of Bergamo, via G. Marconi, 24044, Dalmine (BG) – Italy

Abstract: The Urban Distribution (or Consolidation) Centers (CDU) are one of the available solutions for the last mile logistics that have gained greater interest in both academic and transportation corporate fields. Despite the widespread of the projects involving CDUs, only few of them are recognized as effective over the years. In this paper, through a case survey methodology, we identified the common elements of successful projects and aspects that have instead caused their failure; the final aim is to identify best practices and common mistakes in developing a new urban distribution center project.

Keywords: Urban Distribution Centers (UDC), city logistics, urban freight, last-mile deliveries

1. Introduction

Last mile delivery is one of the most expensive activities within the overall delivery process, accounting for roughly 28% of its total cost (Goodman, 2005). In particular, last mile deliveries in urban centers are constantly under pressure due to an array of causes: the increasing share of the population living in urban areas, the fragmentation of the demand, the reduction of delivery lead time, the increasing frequency of deliveries due to the e-commerce and the presence of multiple stakeholders with conflicting goals (Lagorio et al., 2014) contribute in making city logistics (CL) a complex and challenging subject. Dealing with these challenges, since the '90s several initiatives aimed to study, understand, implement and optimize freight transport on an urban scale have been started worldwide. Among the CL solutions that have been explored more extensively from both the scientific and practitioner viewpoints, Urban Distribution Centers (UDC) or Urban Consolidation Centers (UCC) represent an appealing idea, at least in theory. The first distribution centers appeared in the 70s, but it is from the mid-90s, with the support and indication of European Union (European Commission, 2001), that UDC projects have really spread across Europe. The main goal of this solution is the creation of transhipment centers where goods destined inside the city are collected, aggregated and subsequently restarted towards the final destinations in a more efficient way. There are several UDC schemes although the underpinning working mechanism is usually the same: the carriers unload goods destined to the city in the UDC (usually located a few kilometres from the city center), where the goods are consolidated and delivered to the final destination through smaller, more sustainable vehicles (i.e., methane gas or electric powered) with a higher load factor compared to the load factor of the original carriers. In this way, large, almost empty, pollutant heavy vehicles can be replaced with full smaller trucks and vans (Allen et al., 2012). An efficient and clean last mile delivery system allows to have a positive impact on the entire system by reducing the number of vehicles and, therefore, reducing the levels of congestion and emission in urban centers. Cities that choose to adopt this solution usually also adopt very restrictive regulations for accessing the city center, with the aim at fostering (or sometime imposing) its use: payment of tolls at the city entrance and small free delivery time windows for all those who do not use the UDC service are few common examples.

In literature, the topic of urban distribution centers, has been addressed mainly through multiple (Chwesiuk et al., 2016; Browne et al., 2005) or single case studies (Tozzi et al., 2014; Van Rooijen and Quak, 2010; Marcucci and Danielis, 2008) which usually analyse best practices (Allen et al., 2014) and pilot projects. However, if the success factors for the UDC are well addressed in literature, the same cannot be said for the reasons for their failure. Indeed, it is very difficult to find information on failed UDC projects and initiatives. In addition to the reports from Browne et al. (2005), many authors have begun to highlight the issues relating to the management (Quak and de Koster, 2009) and economic sustainability (Kin et al., 2016) of urban distribution centers. In this paper, we start addressing the analysis of failed cases involving UDCs. Through a survey involving 83 UDC projects in Europe, and the use of secondary data (i.e., European projects reports and networks reporting database such as Civitas, Eltis, Citylog, Bestfus, C-Liege, the Internet sites of local administrations, or articles from popular magazines and newspapers) we sought to highlight the main elements that lead to the success or failure of projects involving UDC.

2. The research method

In order to analyse the main factors leading to the success or failure of UDC projects, a case survey methodology with secondary data was used. The survey methodology allows to identify patterns and perform statistical tests across different case studies (Lucas, 1974) overcoming the problem of generalizing from a single case study and providing more in-depth analysis of complex organizational phenomena than questionnaire surveys (Larsson, 1993). To overcome some limitations of this method (i.e., lack of data, inhomogeneity of data, different levels of precision of the data available) secondary data were used (Cowton, 1998). Secondary data can be defined as data collected by others, not specifically for the research question at hand (Stewart, 1984). In our case, with the term secondary data we refer to data collected by governmental and regulatory bodies (i.e., censuses, national and international reports and regulations, open databases, Chamber of Commerce's date) and companies (i.e., annual activities report, financial data, official website). Moreover, we considered data from press (i.e., newspapers articles, websites) and grey literature (i.e., not published academic researches, reports, white papers). According to the model of case survey methodology proposed by Larsson (1993), we first identified a group of relevant case studies for the analysis of urban distribution centers; then, we defined the variables to analyse for each projects. Next, we used multiple rating scales to code the cases and finally we moved on to the analysis of the data collected.

| General Information | City |
	Population
	Surface
	Density
	Project Name
	Starting Year
	Ending Year
Fundings and management	Private
	Public
	Partnership
Type of initiative	Research
	Pilot/trial
	Operational
State/Outcome	Active
	Ended (with motivation)
Characteristics of active projects	Area Served
	Modal Shift
	L/U Bayes
	Access Restrictions
	Reserved Lanes
	Informations
	Vehicles types
	Services

Table 1: Variables extracted from each project

To identify relevant case studies, we analysed the projects contained in the scientific literature and in the reports of the main networks of European projects of city logistics (i.e., Civitas, Eltis, Citylog, Bestfus, C-Liege). This analysis led to the selection of 83 projects. We leveraged on previous work of Browne et al. (2005) and Allen et al. (2012) to determine the variables to extract from each project (Table 1).

At this point, the projects have been divided equally between the authors and each one has filled the table with data relating to projects. The ambiguous cases were discussed, and to complete the missing data a research on the official websites of municipalities, the official Internet sites of the companies that manage the UDC and on newspapers was carried out. The use of the case survey methodology with multiple sources enhanced both the reliability and validity of the study (Frankfort-Nachmias and Nachmias, 1992), but there are also some limitations. The need to codify the variables inevitably leads to a simplification of the process. Moreover, despite the use of secondary data, for some projects, especially private ones, it was not possible to obtain other information than those relating the start of the project (about 19% of the projects).

3. Main findings

The analysis has resulted in 83 projects of urban distribution centers: 50% of these are unsuccessful cases, 26% are still active, while for the remaining 24% it is very difficult to find the necessary information beyond the initial stages of implementation of the projects (Figure 1).
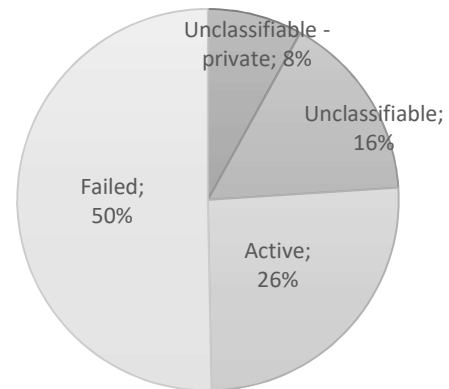
Figure 1: Projects analysed

This is partly explained by the fact that many projects are private (about 8% of the total). The companies do not want to release data for competitive reasons. It can be also observed that countries where more UDC projects started are the UK and Germany, followed by France, the Netherlands and Italy (Figure 2).

As previously mentioned, the dissemination of the UDC projects has taken place since the 90s until the late 00s.
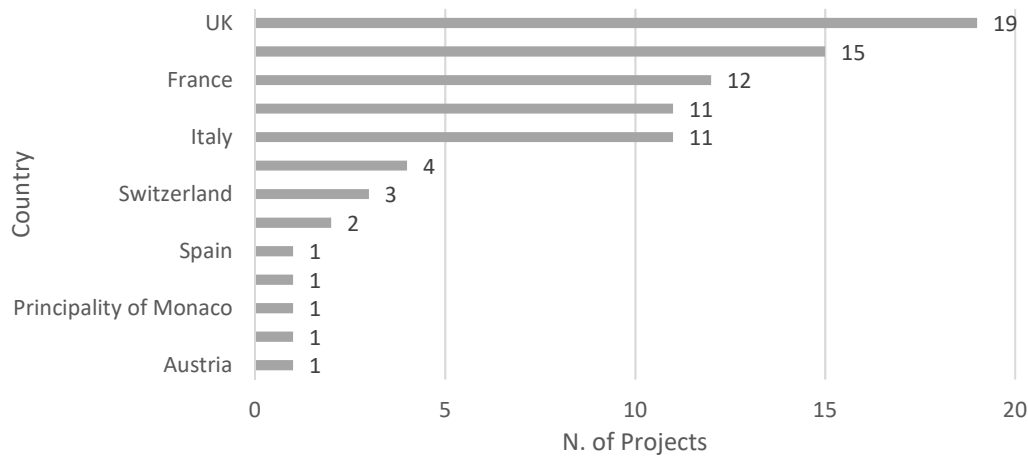
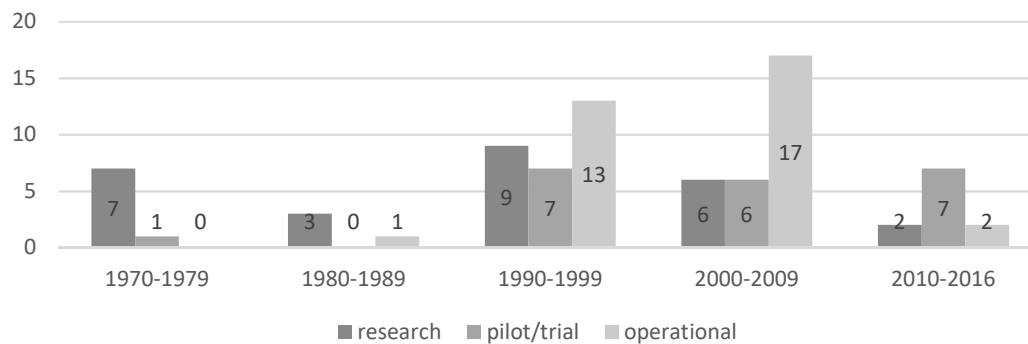Figure 2: UDC projects in European Countries

Figure 3: UDC projects distribution in time

Initially, the focus was on the research stages, in particular about understanding whether the carriers were interested in the use of consolidation centers and about optimal positioning of the center in the city. Later, thanks to the incentives of the European community and national governments, many UDC projects were launched and remained active for many years. In recent years, however, we noted an increase in pilot projects / trials respect to operational projects; this is because, as a result of failures recorded since the mid-90s, more attention has been paid to the phases of analysis of the project feasibility (Figure 3).

3.1. Active projects

At a closer examination of active projects, it can be observed that there are some recurrent features, resulting in a sort of efficient pattern. In all the analysed active cases, great attention was given to stakeholders' involvement, and there have always been extensive negotiations between UDC managers, municipalities and carrier, to ensure competitive prices and delivery times compared to the current situation. The stakeholders mainly involved are the municipality, the national and local governments, Ministry of transport, couriers, suppliers, retailers, traditional and green carriers. To involve stakeholders, in most cases local discussion tables have been set up to follow every step of the implementation and management of the urban distribution center (i.e., Padova, Amsterdam).

In some cases, in addition to the discussion table, particular solutions have been created like sharing information platforms (i.e., La Rochelle) and permanent freight forum (i.e. Norwich). In the active projects, the distribution centers are managed through public-private partnership or private that use public incentives. In particular, we observe that in 61% of the cases the UDCs are handled by existing inland freight terminals for which the urban distribution does not constitute the core business, but one of the provided services. The remaining 39% of the centers are managed by logistics operators and couriers (i.e., DHL floating distribution center in Amsterdam), or with the support of large companies operating in the area (i.e., Heineken in Amsterdam FREVUE project). In 78% of the cases, the UDC serves only a limited area having very restrictive access rules for goods vehicles (67% of cases) with the use of sustainable vehicles (77% of cases). Then, there are projects that have been able to gradually increase the number of users increasing the services offered by the UDC, such as the ability to store and transport fresh products (e.g., La Rochelle, Lucca, Utrecht), possibility of reverse logistics (e.g., Brussels, Groningen, Vicenza) or providing real-time tracking of vehicles (e.g., Padua, Norwich, Malaga). Beyond these common elements, there are many of the still active projects having characteristics that make them
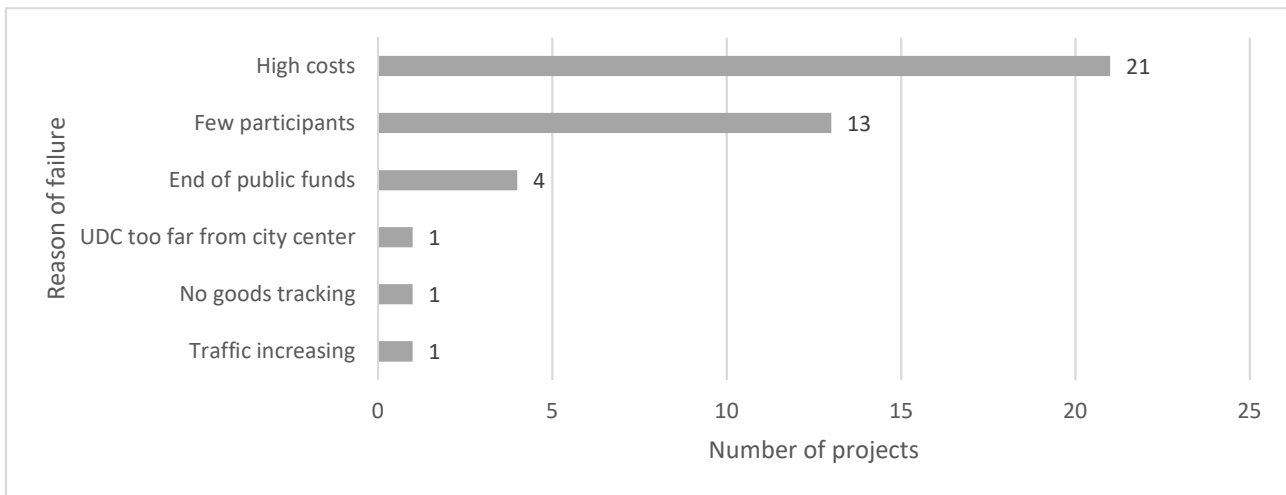
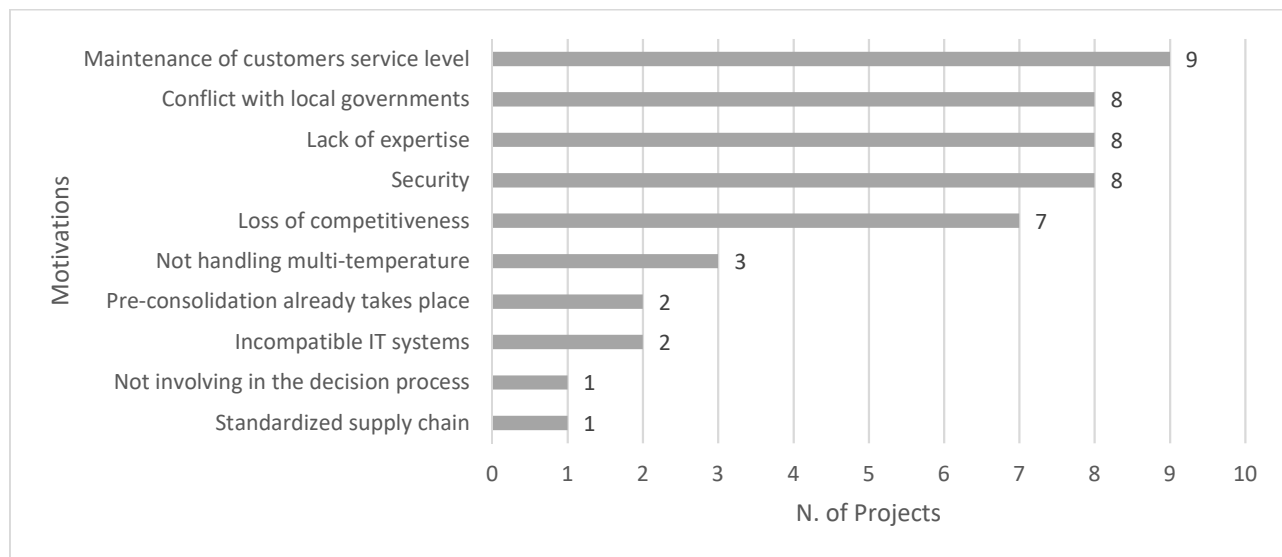**Figure 4: Main reasons for the UDC projects failures**

Figure 5: Reasons of stakeholders' non-participation

unique and difficult to replicate in other cities: the canals in Amsterdam, the presence of a UDC serving two cities (Bristol and Bath) or the presence of railway stations in the city center (London Euston).

3.2. Failed Projects

Despite having some features of efficient pattern (i.e. district area served with limited accessibility, presence of freight village), some of the analysed projects have failed to achieve efficiency and have been closed or abandoned. The main reasons for failure should be sought in the high costs that do not allow the distribution center to cover the operating costs (Figure 4). High costs are often due to the lack of participation by carriers that do not provide sufficiently high flows of goods.

Among the reasons given by the carriers who decide not to participate or abandon the project we find conflicts with the local government (Figure 5); in fact, the rules for accessing the city center are often very restrictive, and the obligation to use UDC is experienced as impositions by the carriers. This is a very sensitive issue for hauliers which,

among the reasons for non-adherence to the UDC, often indicate "not being involved in the decision making process leading to the creation of the UDC". Next comes the fear of not guaranteed level of service to customers, fear that managers of the service do not have the skills to do that, fear that the system is not safe and fear to lose market competitiveness. Among the other causes, we found that, usually, to avoid further increase in the UDC management costs, goods that need refrigeration cannot be handled and this is a problem for all carriers supplying the HoReCa (Hotellerie-Restaurant-Café) sector, usually one of the most presents in urban centers. Finally, in the case of Augsburg, transporters say they have adhered because the textile chain, historically the most widespread in the area, had reached a level of standardization that using a UDC would complicate operations.

4. Discussion and conclusion

In this paper, we presented the first results of the study concerning the reasons of success and failure of UDC in city logistics projects. The findings from the study show that the projects that have been successful and have gone

on over the years, expanding the services offered and the number of participating carriers (i.e., La Rochelle, Padua City Porto) were characterized by i) the involvement of stakeholders, ii) the involvement of an inland freight terminal (when available), iii) the involvement of a logistics provider to which the urban distribution service does not constitute the core business, but one of the services offered and iv) by the presence of strong restrictions on access to the city center from goods vehicles. Then, we observed how even the failed projects have certain characteristics in common, in particular the high cost of ownership and the lack of participation of stakeholders. Going to dig deeper, we realized that the reasons for non-participation are mainly related to the relationship with local governments. Carriers perceived the UDC as a strongly top-down solution that they accept and suffer without being able to take part in the decisional processes. Further, the fear that an adequate and competitive service could not be guaranteed reflects an incorrect management of relationships and sharing information with stakeholders.

It is a common thinking that the stakeholder theory is not addressed to the contexts like the city logistics (Ballantyne et al. 2013) in which the role of decision maker is played by the public governments and in which citizens play an active role. Many studies have been conducted regarding the best placement of a UDC, the optimal vehicle routing for the UDC deliveries and the economic sustainability, but there is still very little research on the management of stakeholders and their involvement in the decision-making process for the creation of urban distribution centers, something that is rather crucial as we observed in this study. A further step in this research consists in targeted interviews with some success projects managers to identify more precisely the lever elements for a successful stakeholders' involvement in urban distribution centers projects.

References

European Commission (2001), European transport policy for 2010: time to decide, http://ec.europa.eu/transport/themes/strategies/doc/2001_white_paper/lb_com_2001_0370_en.pdf. Last accessed: May 15, 2016.

Allen, J., Browne, M., Woodburn, A., & Leonardi, J. (2014). A review of urban consolidation centres in the supply chain based on a case study approach. Supply Chain Forum: an international journal, 15(4), 100-112.

Allen, J., Browne, M., Woodburn, A., Leonardi, J. (2012). The Role of Urban Consolidation Centres in Sustainable Freight Transport. Transport Reviews, 32, 473–490.

Ballantyne, E.E.F., Lindholm, M., Whiteing, A. (2013). A comparative study of urban freight transport planning: addressing stakeholder needs. Journal of Transport Geography, 32, 93–101.

Browne, M., Sweet, M., Woodburn, A., Allen, J. (2005). Urban Freight Consolidation Centres, Final Report Transport Studies Group, University of Westminster; for the Department for Transport; 2 November 2005.

Chwesiuk, K., Kijewska, K., Iwan, S. (2010). Urban consolidation centres for medium-size touristic cities in the Westpomeranian Region of Poland. Procedia-Social and Behavioral Sciences, 2(3), 6264-6273.

Cowton, C. J. (1998). The use of secondary data in business ethics research. Journal of Business Ethics, 17(4), 423-434.

Frankfort-Nachmias, C., Nachmias D. (1992). Research Methods in the Social Sciences, Fourth Edition (Edward Arnold, London).

Goodman, R.W. 2005. Whatever you call it, just don't think of last-mile logistics, last. Global Logistics and Supply Chain Strategies. Keller International Publishing Corporation.

Kin, B., Verlinde, S., van Lier, T., Macharis, C. (2016). Is there life after subsidy for an urban consolidation centre? An investigation of the total costs and benefits of a privately-initiated concept. Transportation Research Procedia, 12, 357-369.

Lagorio, A., Pinto, R., Golini, R. (2014). City logistics issues in small-medium cities: an overview of the Bergamo case from an industrial engineering perspective. Proceeding of the XIX Summer School "Franesco Turco", Senigallia (AN), 9-12 September 2014.

Larsson, R. (1993). Case survey methodology: Quantitative analysis of patterns across case studies. Academy of Management Journal, 36(6), 1515-1546.

Lucas, W. A. (1974). The case survey method: Aggregating case experience, R-1515-RC. Santa Monica, CA: Rand Corporation.

Marcucci, E., Danielis, R. (2007). The potential demand for a urban freight consolidation centre. Transportation, 35, 269–284.

Quak, H.J. (Hans), de Koster, M. (René) B.M. (2008). Delivering Goods in Urban Areas: How to Deal with Urban Policy Restrictions and the Environment. Transportation Science,43, 211–227.

Stewart, D. W.: 1984, Secondary Research: Information Sources and Methods (Sage, Beverly Hills).

Tozzi, M., Corazza, M.V., Musso, A. (2014). Urban goods movements in a sensitive context: The case of Parma. Research in Transportation Business & Management, Managing Freight in Urban Areas, 11, 134–141.

Van Rooijen, T., & Quak, H. (2010). Local impacts of a new urban consolidation centre–the case of Binnenstadservice. nl. Procedia-Social and Behavioral Sciences, 2(3), 5967-5979.