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**Abstract**: The rising urbanization and the consequent increasing pressure on efficient urban freight distribution activities have laid the ground for a set of City Logistics (CL) initiatives addressing the negative externalities generated by goods transportation, such as pollution, traffic congestion, and inefficient use of infrastructures. Although several CL pilot projects have been developed, and some initiatives have succeeded in generating benefits for the stakeholders involved, both public and private stakeholders are often still unsure when it comes to launching new initiatives because they are unable to foresee the long-term economic and financial sustainability of such projects. However, these issues are seldom addressed. In fact, only recently researchers and practitioners have started to elaborate methodologies aimed at assessing the economic viability of CL initiatives. The present work contributes to this research stream by developing a business model framework for the assessment of CL projects. To this end, an existing business model framework has been adapted to the context at issue by modifying its components via a desk research based on existing literature and a number of international projects. The developed framework constitutes a tool to comprehensively capture all the elements of a CL business model. Therefore, it can be applied to analyse success and failure factors of existing projects, in order to provide recommendations about the feasibility and long-term sustainability of future CL initiatives.

**Keywords**: City Logistics; Business modelling; Assessment framework; Project feasibility

## 1. Introduction

The rising urban freight demand and the resulting crucial impact on sustainable urban development has spawned the City Logistics (CL) notion as a set of studies and initiatives to respond to the negative externalities generated by urban freight transportation, such as pollution, traffic congestion, and inefficient use of infrastructures (Fatnassi et al., 2015; Taniguchi et al., 2001). Several CL projects have been developed worldwide and many have proved successful. However, public and private stakeholders are often unsure when it comes to launching new initiatives because they are scarcely able to perform a comprehensive ex-ante assessment of the benefits that can be gained (Witkowski and Kiba-Janiak, 2012).

In particular, although their business feasibility and scalability are key drivers of the economic and financial long-term sustainability of CL projects, they are seldom addressed because of a lack of specific assessment methods, which derives from the difficulty of framing CL initiatives within the traditional tools for analysing business viability. In this context, researchers and practitioners have recently started to elaborate assessment methodologies to better evaluate the economic viability of CL initiatives. However, more business-oriented perspectives are needed to foster a thorough understanding of the benefits, limitations, and potentials of CL projects. In order to contribute to filling such research gap, the present study builds upon the work by Hamel (2000) on business models in the Information and Communication Technology (ICT) industry and puts forward a conceptual framework for assessing CL business models. The concept of business model provides a qualitative framework to assess the potential economic value that an organization can create by exploiting a new technology or new product, how a company structures its relationships with external stakeholders, and the consequences of this variables and relationships on the company performance (Saebi and Foss, 2015).

The paper is structured as follows. Section 2 is a review of the relevant literature, while Section 3 presents the methodology of the research and the fundamentals of developing the framework. In Section 4, we introduce the proposed framework. Finally, benefits, limitations, and implications of the work and future research directions are presented in Section 5.

## 2. Literature review

### 2.1 Business assessment of City Logistics projects

Traditionally, the scope of assessing a CL initiative includes the identification of relevant stakeholders and their objectives (Anand et al., 2012), and the evaluation of the degree to which these objectives are met (Macharis, 2009). However, having many different actors with different and sometimes conflicting interests is a crucial difficulty when it comes to assessing CL projects (Gammelgaard, 2015). Arguably, these conflicting interests

derive from the entity of the economic impacts on the core business of the different stakeholders (Stathopoulos et al., 2012). Therefore, the evaluation of the economic and the financial sustainability of the project itself constitutes one of the challenge of assessing CL projects.

In response to this issue, scholars and practitioners have begun looking for conceptual frameworks that take into account all the relevant aspects of the business model of a CL initiative. In their CL taxonomy, Benjelloun et al. (2010) include some aspects of the business model, such as infrastructure financing and management, and the degree to which CL projects are financially viable or benefit from some form of subsidy or competitive advantage. More recently, Quak et al. (2014) evaluated a modular pack station for parcel deliveries with the business model canvas by Osterwalder and Pigneur (2010), aiming at "evaluate how the use of the Bentobox can contribute to the value proposition of its user". The authors highlight that it is easier for a CL initiative to be financially feasible if it delivers a clear value proposition to customers rather than society as a whole. The same conceptual framework (i.e. the business model canvas) was used to assess the degree to which the STRAIGHTSOL projects can reach both a market viability and an organizational fit (Posthumus et al., 2014). On the one hand, market viability expresses the customers' willingness to pay for the proposed service (i.e. potential market size). On the other hand, organizational fit measures the degree to which an investment is integrated with existing processes and competencies of the involved stakeholders.

Although the application of the business model canvas provides significant insights, it is argued here that high is the need for conceptual frameworks specifically designed for the CL arena. Hence, a literature analysis on the concept of the business model is required to identify common aspects that a business model assessment framework for CL should take into account.

### 2.2 The notion of business model

Johnson et al. (2008) consider the business model as the interlocking of four different components (customer value proposition, profit, key resources, and key process) that together create and deliver value. Value indeed constitutes a central aspect of a business model in terms of value offered to customers and generated by the company from a cash flow point of view (Barneto and Ouvrard, 2015). Hence, business model concepts include the following elements: a value proposition, which is a bundle of benefits to customers (Osterwalder and Pigneur, 2010); the revenue model adopted to gain a share of the value created; the value chain needed for delivering the value proposition including key resources, key processes and key partners; and the cost structure, seen as the cost of the entire value chain.

To represent, describe, and analyse all the elements of a business model, several concepts are available in literature. However, some refinements and modifications are necessary in order to fit a business model framework to the CL field. First of all, while a company should set itself apart from the competition through its business model (Moore, 2002), CL initiatives do not aim at differentiating themselves from other initiatives, by means of developing and offering a specific product based on the requirements of a specific customer segment. Second, all stakeholders involved in the process of planning and executing the project form a collective system. Hence, the value chain is developed within the boundaries of this collective system rather than between a company and its key partners.

## 3. Methodology

First, the main dimensions that have to be integrated when assessing a business model have been analyzed. Such dimensions can be retrieved from specialized literature in the form of a conceptual framework. A suitable framework is the one proposed by Hamel (2000), which has the ability to represent a business model at a high level of detail ((Mäkinen and Seppänen, 2007), as well as being consolidated and adaptable to other contexts. Then, sixteen CL initiatives and projects are analysed and used to develop, refine and confirm the assessment approach. These initiatives are selected so that a thorough and diverse depiction of the problem at issue is provided (Table 1). Each project can be found in a number of publications, proving its relevance in the CL arena.

**Table 1: Selected CL projects**

| Type of project | Project name | City | N° of ref. |
|---|---|---|---|
| Delivery with low-emission vehicles | DPD-Electric vehicles | Stuttgart (DE) | 2 |
| | Cargohopper | Utrecht (NL) | 3 |
| | Zero Emission Boat | Utrecht (NL) | 2 |
| | City Cargo | Amsterdam (NL) | 4 |
| ICT application | iLadezone | Vienna (AT) | 2 |
| | Logistics Tool | Basel (CH) | 3 |
| | Multi-use lane | Barcelona (ES) | 1 |
| Urban Consolidation Centres (UCC) | City Porto | Padova (IT) | 4 |
| | Monaco UCC | Montecarlo | 3 |
| | Binnenstadservice | Dutch cities | 5 |
| | Bristol city UCC | Bristol (UK) | 3 |
| Micro-consolidation centres (MCC) | Gnewt Cargo | London (UK) | 4 |
| | Consignity | Paris (FR) | 3 |
| | ELP – Espace de Livraison de Proximité | Bordeaux (FR) | 3 |
| | Mobile depot | Brussels (BE) | 2 |

## 4.The CL business model assessment framework

The proposed framework is represented in Figure 1.

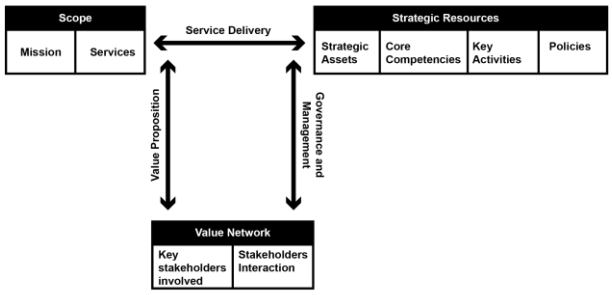


**Figure 1 The proposed assessment framework**

In the following sections, all the elements composing the business model framework are presented and thoroughly explained, including the subcomponents and the different possible alternatives that CL projects currently adopt for each of the subcomponents of their business model.

### 4.1 Scope

Two elements are combined within the Scope component of the proposed assessment framework: the Mission of the project and the Services offered by a CL project to the stakeholders.

*Mission*: This subcomponent includes the main objectives of a CL project. The most common objective for CL efforts is to reduce environmental impacts through sustainable freight distribution systems. Most of the initiatives studied for this paper comprise the introduction of electric vans (e.g. DPD in Stuttgart) or other low impact vehicles (e.g. the Zero Emission Boat in Utrecht). In addition to the introduction of green vehicles, one objective pursued by CL initiatives is to optimize existing transportation infrastructures by means of exploiting part of the network formerly used only for passenger transportation, or incentivizing off-hour deliveries to relieve urban roads from traffic congestion. For instance, the Cargohopper service in Utrecht delivers goods through the city canals, increasing the amount of kilometres of the transportation network devoted to freight distribution. Implementing more sustainable freight distribution systems and optimizing existing networks include objectives that can be measured in terms of reduction of negative impacts, such as emission, congestion and nuisance. However, in the process of designing the project, all stakeholders should cooperate, especially when the scope of the project is broad (see the use of MAMCA methodology in the STRAIGHTSOL project). Hence, increasing the cooperation between stakeholders becomes an important goal, as in the case of Bristol UCC where the municipality managed not only get all the stakeholders to collaborate but also to keep track of the performances through periodical reviews to discuss results and monitoring KPIs. Finally, some CL initiatives have been addressing the needs of local retailers, who suffer from lack of storage space and therefore require a higher amount of smaller deliveries.

Addressing the needs of local retailers requires the stakeholder in charge of operations to deliver a specific set of *services*, and this is the main reason to combine mission and services within the same component of the assessment framework. Services can range from distribution, freight consolidation, or other value added services such as ITS platform management or maintenance. As anticipated, if the mission is to address the needs of local retailers, other value-added logistics services such as storage, waste collection and home deliveries needs to be offered, as in the case of Binnenstadservice, a non-profit organization that caters logistics services to inner city retailers in selected cities in the Netherlands. Finally, ICT services can be offered, such as automated procedures to access restricted areas (e.g. exhibition centres) or loading bays booking, (e.g. the iLadezonen project in Vienna).

### 4.2 Strategic resources

Firm-specific resources can enhance a company's competitive advantage. They include strategic assets, core competencies, key activities and policies.

*Strategic Assets* include anything that is valuable to the success of the CL scheme (e.g. patents, infrastructure and data). Three main types of assets are identified, namely Physical assets, Human Resources and Information and Communication Technology (ICT). Facilities (e.g. warehouses), urban spaces for performing logistics activities and vehicles used for the delivery compose the bulk of physical assets for CL initiatives. Sometimes, as in the case of micro-consolidation centres, all of them are required. Moreover, in most projects high is the need for a scaling up of the volume of freight handled and/or the number of organizations to cover the investment costs borne for acquiring the facilities. Hence, the volume of freight handled is an asset relevant to the profitability of the CL initiative. Dedicated human resources are required for projects with a wider scope or when new logistics platforms are installed, as in the Gnewt Cargo or the ELP in Bordeaux. Finally, ICT assets are developed and used for ICT based projects, and include management systems, space-booking platforms, smart units (e.g. for monitoring loading bays) and efficient routing algorithms.

*Core Competencies* are unique skills that are needed to gain a sustainable long-term profit. First,, in order to provide efficiency in service delivery both operational and technical competencies are required by the LSP in charge of all operations. Then, the ability to plan and execute a CL project by creating and managing fruitful partnership with different stakeholders is instrumental for more complex schemes where addressing the needs of multiple organizations is required (e.g. the Consignity project in Paris). Cooperation between different stakeholders also enhances their different competencies when joint logistics solutions are developed (Halldórsson and Skjøtt-Larsen, 2004). Along with the aforementioned competencies, marketing and communication competencies are becoming relevant to the process of gathering more

stakeholders to gain financial sustainability, especially when a wider range of value-added services are offered and customers are asked to completely switch to a new distribution mode (e.g. Binnenstadservice).

*Key activities* transfer inputs (Strategic assets) and skills (core competencies) into outputs, i.e.: the logistics services. In particular, quality control on received goods, handling goods (including cross-docking procedures) packaging processes (see Morganti and Gonzalez-Feliu, 2015) pick-ups and final deliveries emerge from the studied initiatives and relevant literature. Moreover, planning logistics activities by means of optimized vehicle routing and ICT platform management makes distribution and loading/unloading processes more efficient and less time consuming. Urban freight distribution might be severely affected if public municipalities were not able to perform enforcing activities in case of strong commitment to policy measures. Dissemination of results, promotion and customer acquisition provide a bundle of activities that turn marketing and communication competencies in action.

Finally, a fourth sub component related to the *Policies* implemented has been added to the strategic resources. Although policies are usually the focus of evaluation, they are treated here as a mean to reach an objective and, as a consequence, a strategic resource that enables or supports the Mission of the project. Benjelloun et al. (2010) provided a schematic yet comprehensive classification of potential policy measures, which may include time windows, multi-use lanes, environmental standards and low emission zones, load factor control and congestion charge. The Multi-use lane in Barcellona is a typical example of how public policies may generate benefits in terms of planning distribution activities, for instance by reducing uncertainties over loading/unloading and travel times.

### 4.3 Value Network

The Value Network component should represent the ownership of complementary assets to a firm's own resources, namely key suppliers or partners. For a CL project, value creation is enabled by the roles that each stakeholder (e.g. municipalities, carriers, retailers, and landlords) plays in the project and the interactions among all the urban actors and structures (Rose et al., 2016). In this sense, the value network of each CL project is developed by a network of Key Stakeholders, who may show different patterns of interactions among them (Stakeholders' interactions).

*Stakeholders' relationships/interactions* are created by sharing Information Flows and exchanging Financial Flows resulting from delivering services. Information flows between the actors of the CL can turn into benefits for the stakeholders themselves, as in the case of the iLadezonen project where information on loading bays usage can be exploit to better locate loading bays and evaluate users' behaviour. Financial flows repay the funding stakeholders for their investments and for the benefits created and shared with other stakeholders and end users. Financial flows may include congestion or load factor charges paid to the city government by LSPs and carriers, or revenues collected from value-added logistic services, such as in the case of the Binnenstadservice initiative.

### 4.4 The Bridge Components

The three elements above (Scope, Strategic Resources and Value Network) are meaningless if they are deployed as stand-alone components. Hence, a sustainable business model should be able to connect them in order to fully exploit their potential. Three bridge components are defined to link the three main elements of the framework.

*Service Delivery* links the Scope of a project and its Strategic Resources. It explains how resources are deployed to achieve the scope of the project. For instance, traditional one-tier systems comprise a UCC to decouple long-distance freight outside of the city centre, while two-tier systems add micro-consolidation centres as additional decoupling points within urban boundaries.

The *Value Proposition* links Stakeholders' Interactions and Scope, and it represents a bundle of benefits offered to stakeholders. In a CL project, the stakeholder benefits are associated with the achievement of their objectives. For instance, public authorities aim to reduce CO2 emissions, traffic congestion and increase quality of life. Carriers and shippers benefits from lower transportation costs or higher productivity (Russo and Comi, 2012), from which they can offer a lower price to retailers. Finally, retailers benefit not only from lower transportation prices but also from a higher quality of service (Posthumus et al., 2014);

The last bridge component, namely the *Governance*, connects the Value Network to the Strategic Resources. This component answers the questions "who does what" and "who owns which strategic asset" within the CL project. As an example, a public entity may decide to develop new in-house competencies, or subcontract some activities to an external competent legal entity, as in the case of the iLadezones project.

## 5. Discussions and conclusions

The proposed framework can be adopted by public authorities and CL stakeholders to design the business model of a CL project. A possible way to conduct the design session would be to start by defining the main goals of the project together with the related services (*Scope*). Then, the project's stakeholders will identify what are the main benefits associated to the project as well as their mutual interactions (*Value Network* and *Value proposition*). Finally, stakeholders should focus on the Strategic resources needed to develop the project, who owns them and how these resources are deployed (*Strategic Resources*, *Service Delivery* and *Governance*).

From a theoretical point of view, this work gives new insights and opportunities for further research on evaluation tools that would be capable to account for the profitability of private stakeholders' businesses. This framework aims at constituting an enhancement from the traditional business model canvas in capturing the main elements of a CL business model and depicting the overall

complexity of a CL project. Moreover, through the application of the framework it is possible to highlight potential drawbacks and inconsistences in the business models, as shown in the Oslo case study. Finally, it can also act as a support to better categorize CL business models, as seemingly different projects may share similar elements of the business model.

From a practical point of view, the assessment framework can be useful for a variety of stakeholders. Governments can use the framework to evaluate and select the most suitable and promising CL project for their cities because it is capable to provide for recommendations related to its feasibility and long-term sustainability. Proposers of new CL initiatives, such as LSPs or other private entities, can easily capture the potential benefits of their projects and promote them to city governments, their retailers and the community. In turn, the retailers can benefit from a clearer understanding of the value proposition that city governments or LSPs are willing to deliver.

Future research is directed towards a twofold objective. On the one hand, the framework requires field validation via its application to cases not yet reported by the literature and that still need creating their business models. This would confirm the transferability of the business model concept to the CL context. On the other hand, the framework can be extended and improved through integrating quantitative approaches associated to system simulation and stakeholders' analysis that would support ex-ante evaluations.

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