

Evaluation of Urban Consolidation Centers from the Customer's Perspective

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Abstract – An Urban Consolidation Center (UCC) is a logistics solution aimed at reducing negative environmental and traffic effects of freight transportation in cities. This is mainly achieved by the consolidation of loads across customers. Despite having potential benefits, UCCs have not been widely implemented in practice. To realize the theoretical potential of UCCs in practice, a UCC has to attract customers. Crucial for the success of a UCC is a good fit between its services and the requirements of its market. Therefore, this paper addresses how UCCs can be evaluated from the perspective of its direct customers, i.e., freight forwarders and carriers. The Value Proposition Canvas, an established tool for business modeling, is adopted as a framework. The presented framework can be applied in a practical setting and provides the basis for an estimation of a UCC's actual benefits.

Keywords – Urban Consolidation Center, Value Proposition Canvas, city logistics, urban freight transport

I. INTRODUCTION

It is estimated that nearly two-thirds of the world's population will live in cities by 2050 [1]. Volumes of urban freight transport are expected to grow as a consequence. Despite the fact that urban freight transport is an essential element of a city's economic development, it has a growing negative impact on the health and quality of life of city residents [2]. It generates various externalities such as traffic congestion, accidents, road damage, noise pollution, and greenhouse gas emissions [3]. As a result, cities around the world are looking for ways to manage urban freight and its negative impacts. The focus here often lies on restricting urban freight traffic, e.g. through travel time regulations, parking restrictions, road-pricing or vehicle weight and size rules. Ideally, policymakers will find ways of increasing the efficiency of freight transport in urban areas while also reducing its negative effects. Such measures include implementing traffic information systems and intelligent transportation applications, encouraging the use of environmentally friendly trucks, providing dedicated road space for truck loading and unloading, and promoting Urban Consolidation Centers (UCCs) [4][5]. As UCCs are frequently discussed as a measure for reducing negative impacts of urban freight transport, this paper addresses how UCCs can be evaluated with a particular focus on the perspective of the customers of UCCs.

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In Section II we provide an overview of the current situation. We then propose a framework for the evaluation of UCCs in Section III, and discuss the framework's application in Section IV. Finally, our conclusions are presented in Section V.

II. CURRENT SITUATION

UCCs are most commonly defined as operational concepts designed to reduce urban freight traffic by encouraging consolidation of cargo at a terminal located at the periphery of cities or urban areas [6]. One of their most important features is the infrastructural, operational and service-related optimization of the connection between the interurban and urban elements of the transport chain [7]. Carriers that would otherwise make individual trips to the consignee with relatively low load factors instead turn their loads over to a neutral carrier who consolidates the freight and handles the last mile of deliveries within the urban area [6]. The general idea behind UCCs is that freight transport is divided into two parts. From origin to the UCC large long-distance transportation vehicles can be used, and then from the UCC to the drop-off points in the city, smaller and potentially more environmentally friendly vehicles can take over [8] [9].

The most frequent benefits include lower air and noise emissions, less traffic congestion, and fewer traffic accidents, all of which can be attributed to having fewer trucks in the urban area due to consolidation of loads across the UCC's customers [10]. Nevertheless, there are also some disadvantages which should be mentioned. UCCs use a large amount of land and the traffic around the UCC will increase, which can lead to opposition from local residents [6]. It is also important to note that due to the necessary transshipment in the UCC total operating costs and delivery times may increase. Overall, however, a UCC can generally contribute to the enhancement of the urban economy, mobility, sustainability, and quality of life.

In essence, the following factors should be considered when establishing a UCC: (a) the selection of the most suitable location for the facility, (b) the identification of the characteristics of the facility to meet the needs of customers and stakeholders, and (c) the suitability of the concept within the wider context of other projects which are planned for the area in question [7]. UCCs have been discussed or implemented in various European cities, including Amsterdam, Utrecht, Berlin, Bremen, Cologne, Munich, La Rochelle, Basel, Stockholm, Genoa, Padua, Venice, Ancona, Naples, and Milan [11]. Because environmental benefits of a UCC are generally easier to achieve than economic benefits, UCCs have often been publicly funded. As soon as public payments are reduced or stopped completely, there is a risk that the initiative will be discontinued due to an inadequate financial basis [10] [12].

A notable and rare exception here is Binnenstadservice in the Netherlands, which has been successfully operating UCCs for over 10 years. One of its success factors is its business model, which has evolved considerably. Whereas initially small city center retailers were targeted as customers in the beginning, the focus is now on logistics service providers [13]. The development of the business model was based on identifying customers who were actually willing to pay for the UCC services [14]. In summary, this means that the long-term survival of city logistics solutions requires sustainable business models [12]. In order to ensure profitable operation, it can be advisable to expand the scope of the service offering and provide additional services beyond consolidation and distribution that are useful from the customer's point of view [15]. Other critical factors for a sustainable business model include the ability to scale up and down, the flexibility to respond to changes in the dynamic business environment, the entrepreneurial role of the UCC's initiator, community recognition, innovativeness, logistics and supply chain management expertise, and the use of ICT solutions [16].

From the perspective of local authorities, logistics activities often appear to be disorganized and a UCC is seen as a solution for solving the issues that this creates. However, logistics companies may take a different view, as solving issues is actually their job [17]. This shows that a thorough understanding of the requirements of logistics companies, which are the customers of UCCs, is essential for a UCC's long-term success. We will therefore now go on to present a framework for the evaluation of UCCs from the customer's perspective.

III. FRAMEWORK

The framework set out below can be used to evaluate a UCC from the direct customers' perspective, i.e. from the perspective of freight forwarders and carriers. The framework does not address shippers or consignees, which can be seen as indirect customers. The framework aims to fulfill three main requirements: (a) comprehensiveness, i.e. that all the important customer-oriented aspects of a UCC are covered, (b) flexibility, i.e. that the framework can be adapted to different situations, and (c) simplicity, i.e. that the framework can be easily understood and applied.

Crucial for the success of a UCC is a good fit between its services and the requirements of its market. In other words, a proper fit between the value proposition of the UCC's services and the needs of its customers has to be guaranteed. The Value Proposition Canvas, an established tool for business modeling initially developed by Osterwalder et al. [18], has been applied as a theoretical framework to model this fit. The creators of the Value Proposition Canvas also devised the wider concept of the Business Model Canvas, which has been applied for evaluation of city logistics solutions. [12]

The Value Proposition Canvas systematically aligns the value proposition of products or services with the customer profile. According to the ideas of Osterwalder et al. [18], this can be explained as follows: The value proposition describes how the *products or services* offered to customers support them in completing their tasks. Beyond that, the value proposition

includes so-called *gain creators* and *pain relievers*. A gain creator explains how added value is created for customers by the products or services. A pain reliever states how the products or services offered help to solve customer problems. The customer profile describes the *customer jobs*, i.e. the tasks that customers need to complete. For corporate customers, these are essentially specific business activities. The customer profile also comprises *gains* and *pains*. Gains are statements of added value desired by customers, and pains are the problems experienced by customers when completing their tasks. A product or service will be successful if there is a good fit between (a) the services offered and the customer jobs, (b) the gain creators offered and the desired gains, and (c) the pain relievers offered and the customer's actual pains.

Below the Value Proposition Canvas is applied for customer-oriented evaluation of UCCs. Figure 1 illustrates the adopted framework. The value proposition is described for a UCC and the customer profile for its direct customers, i.e. freight forwarders and carriers.

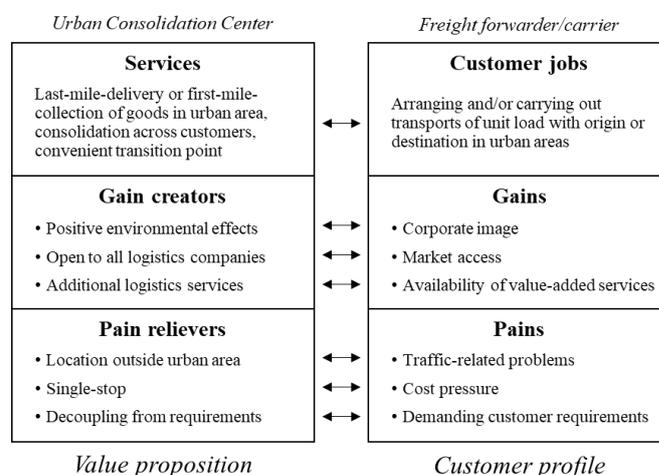


Fig. 1. Evaluation Framework

The services of a UCC can be summarized as last-mile-delivery and first-mile-collection of goods in urban areas. The consolidation of loads across customers and providing a convenient transition point for customers, which allows loading and unloading outside an urban area, are key features of the services. The job of the customers is fundamentally arranging and/or carrying out transportation of unit loads with origin or destination in urban areas.

In the typical situation presented in the framework there is a fit between the services and the customer jobs. However, a fit is not guaranteed if goods require special treatment, such as temperature controlled transportation, or if consolidation across customers is not possible due to the shippers' requirements or for legal reasons.

A fit between the services and the customer jobs is not necessarily sufficient for a UCC to achieve market success. A UCC should additionally aim to offer gain creators which are aligned with the gains desired by customers. The framework includes three gain creators which correspond with three desired gains. Firstly, a UCC typically creates positive environmental effects, which may improve a customer's corporate image if its communications highlight these positive effects. Such positive effects can be achieved by the use of

environmentally friendly vehicle drive technologies by the UCC. Such technologies are currently limited in terms of range and load capacity. Relatively short journeys between the UCC's facilities and destinations in the urban area, and relatively small load sizes facilitate the use of environmentally friendly vehicles. Positive effects can also be achieved by a reduction in traffic, and consequently emissions, due to optimized routes. A UCC consolidates loads across customers, which helps to optimize routes in terms of utilization of the cargo space and distance traveled. Secondly, a UCC is generally open to all logistics companies, which can help UCC's customers to improve their access to markets. This should be particularly relevant for small- and medium-sized logistics companies with limited capabilities and resources. Thirdly, a UCC can offer additional logistics services, such as kitting, packing, labeling, quality control, returns management and waste disposal. A UCC can also provide logistics consulting services and training. The UCC's customers can benefit from the availability of such value-added services, especially when integration with the UCC's core services is achieved. Small- and medium-sized logistics companies with limited capabilities and resources may again particularly benefit here.

In the ideal typical situation presented in the framework, a good fit between the UCC's gain creators and the gains desired by the customers is achieved. However, in practice such a fit depends on the specific circumstances and preferences of the UCC's customers. If customers do not believe that a UCC is capable of delivering the defined gain creators and/or have no actual need for the defined gains, there is a danger that the fit will not be achieved.

In addition to a fit between the services and customer jobs, as well as gain creators and gains, the UCC's market success may depend on the alignment of the UCC's pain relievers with the pains customers are actually experiencing. The framework defines three pain relievers which correspond with three customer pains. Firstly, a UCC offers customers a facility for convenient loading and unloading. The location outside an urban area and the easy road access constitute a pain reliever for traffic-related problems. Several customer pains related to urban traffic are directly addressed by a UCC, e.g. traffic disruptions, problems with loading and unloading, as well as strict regulations relating to urban freight traffic. Secondly, customers deliver to or pick up loads from the UCC and the UCC takes care of the distribution in the urban area. This results in a single stop for customers, i.e. the UCC relieves customers of the pain of multi-stop routes. Such multi-stop routes add to logistics companies' cost pressure, as route planning requires resources and loading and unloading are generally cost-intensive activities. Thirdly, logistics companies may have to meet demanding requirements of their customers, i.e. shippers. Such pains may include, but are not limited to, requests for high delivery reliability, specification of narrow delivery windows, and refusal of irregular deliveries with relatively small quantities. The UCC can offer a pain reliever by at least partly decoupling logistic companies' operations from these demanding requirements, as the UCC takes over the distribution on the last mile.

The ideal typical situation of the framework presents a good fit between the UCC's pain relievers and customers' pains. As already mentioned above, the practical realization of the fit depends on the specific circumstances and preferences of the UCC's customers, as well as on their assessment of the UCC's capabilities.

IV. APPLICATION

The framework presented in the previous section helps to evaluate a UCC from a customer's perspective. The framework represents ideal typical fits between the value proposition of the UCC and the requirements of its customers. These are not derived from empirical results, but primarily based on logical assumptions. These assumptions should be scrutinized by means of an empirical survey addressing potential or current customers of a UCC. The following questions should be answered: To what extent do customers believe that a UCC is capable of delivering the defined services, gain creators, and pain relievers? To what extent customers really have to complete the defined tasks, want the defined gains, and experience the defined pains? The deviations between the ideal typical situation and the actual situation as expressed by the customers provides the basis for an estimation of the UCC's actual benefits. Indications for the proper configuration of the UCC can also be derived from such a comparison.

The framework presented here focuses on the benefits of a UCC. These benefits do not come for free, i.e. they come at a cost to the customer. Consequently, a comprehensive evaluation also has to investigate the related costs incurred by the customers of a UCC. These costs are not just the charges that the customers of a UCC have to pay for the service, but may also include losses in terms of quality and time. A quality loss may occur if the customer is no longer able to control the entire transport chain. A time loss can result from the transshipment step at the UCC, which adds some additional time.

V. CONCLUSIONS

A UCC aims to address two major challenges in city logistics: It helps to reduce environmental pollution and to ease traffic congestion caused by urban freight transport. UCCs are therefore a common topic in the literature and city planners are familiar with the UCC concept. Despite having the theoretical potential to improve city logistics UCCs have not been widely implemented in practice, and there are even examples of failed UCCs. This begs the question of how the full theoretical potential of UCCs can be realized in practice.

To be successful, it is obvious that a UCC has to attract customers, i.e. freight forwarders and carriers. There are at least three possible levers on demand for the services a UCC offers. Firstly, legal interventions, such as restrictions on entering a city or congestion charges, can make UCCs an attractive alternative. Secondly, public funding can give UCCs a competitive advantage. Thirdly, a customer-orientated service design, founded on actual customer needs which stimulates customer demand. If the customer-oriented approach is

followed, a thorough understanding of the customers' requirements is essential. In this paper we have presented a framework for the evaluation of UCCs from the perspective of its customers.

In 2021 this framework was applied in a practical setting in Austria. The use case proved the framework's applicability and practicability. However, the framework also has limitations. For the success of UCCs, the needs of indirect customers, i.e. shippers and consignees, can be crucial, but are not addressed by the framework. Other stakeholders of UCCs, like employees and local residents, may also determine whether operations are successful in the long-run. Consequently, we suggest a comprehensive evaluation that considers the requirements of all stakeholders. The framework presented in this paper could be integrated into such a comprehensive evaluation approach.

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