Stakeholders' roles for Business Modelling in a City Logistics ecosystem: towards a conceptual model

# STAKEHOLDERS' ROLES FOR BUSINESS MODELLING IN A CITY LOGISTICS ECOSYSTEM: TOWARDS A CONCEPTUAL MODEL

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## ABSTRACT

A major challenge associated with the implementation of CL initiatives lies with their economic and financial long-term success. In this context, the business model concept can support assessing the business side of stakeholders' decision-making processes as major determinants for such success. The purpose of this work is to overcome the shortcomings of the business model approach applied to CL systems. To this end, a conceptual model is built from a role-based business ecosystem modelling approach to provide a business model representation of the CL business ecosystem, able to identify and explore the components of the system and their dynamics.

## INTRODUCTION

Several City Logistics pilot projects proved to be successful in satisfying most of the CL stakeholders' objectives. However, only few of these projects are expanding their scale of application beyond the initial pilot experimentation, and other failed because of divergent objectives between the stakeholders or low profitability (Gammelgaard 2015). Hence, a major challenge associated with the implementation of CL initiatives lies with their economic and financial long-term sustainability.

Arguably, we can trace the roots of both the current inefficiencies of urban distribution activities and the barriers to the implementation of innovative projects in the heterogeneity of the involved stakeholders. In this context, more research is needed to address the main drivers that lead to long-term economic success of CL initiatives, in the face of the dynamics that arise from the distributed decision-making processes of the stakeholders that may unfold in different CL systems' setup. To this end, it is instrumental to take explicitly into account the business aspect of these decision-making processes as a major determinant for the long-term success of CL initiatives. The business

model concept can be of great help when it comes to assess the business decision-making criteria underlying the success or failure of a CL initiative.

However, to this day the business model approach has been seldom applied to project evaluation. Quak et al. (2014) evaluated the Bentobox solution (i.e. automated parcel lockers for B2C and B2B deliveries) with the Business Model Canvas by Osterwalder & Pigneur (2010). The same framework was used within the STRAIGHTSOL project to assess the degree to which CL initiatives have a market viability and an organizational fit (Posthumus et al. 2014). Lastly, van Duin et al. (2016) devised a business model framework to assess the value creation processes generated by the relationships between CL stakeholders in Urban Consolidation Centers (UCC). However, there are significant challenges, related to the application of business model concepts in CL. In fact, business modelling has proved to be of value for analyzing a single firm's business environment rather than a network of stakeholders (Reuver et al. 2013).

The purpose of this work is to overcome the shortcomings of the business model approach applied to CL systems. To this end, CL systems are here compared to business ecosystems, which are a network of interrelated business entities, characterized by value transfer and value co-creation mechanisms (Wang et al. 2015), operational transactions and interdependencies between business entities (Solaimani et al. 2015).

The decision-making processes by various stakeholders and the resulting dynamics and impacts on the CL system seem to fit with the outlined characteristics of business ecosystems. Moreover, a role-based modelling approach is adopted to provide a business model representation of the CL business ecosystem able to identify and explore the components of the system and their dynamics. In this ecosystem modelling framework, roles are defined as "an aggregation of common functions, including activities, decisions, and metrics" (Tian et al. 2008). In this sense, while the role definition does not change, business entities make decisions in reaction to the changes in the ecosystem by taking on certain roles in the CL system. These decisions are based on their objectives, information, and constraints. The business model of a business entity within the system is then defined as the set of the roles it plays, the business and operative relationships formed with other business entities, and the monetary and intangible values exchanged through these relationships.

In order to show the contribution of the CL business model framework some existing CL concepts are illustrated and analyzed under the lens of the framework, including cases of Urban Distribution Center (van Duin et al. 2016) and parcel lockers installation (Weltevreden 2008).

This research work aims to overcome existing issues in business oriented dynamic assessment tool for CL, thus supporting the ability of researcher to gain insights of the potential for long term success of CL systems. In this paper the following research question will be answered:

*How can we setup a business modelling approach to understand the dynamic decision making process of the CL stakeholders?*

The structure of the paper is the following. First, in the next section the theoretical background for this paper is reviewed. Then, the CL ecosystem business model framework is presented, and some CL concepts are depicted through its lens. Then, a process for the formalization required for the Agent Based Model implementation is shown, and finally implications are drawn.

## RESEARCH BACKGROUND

### Business model concept

Business Modelling (BM) is a framework to evaluate the potential economic value that an organization can create selling a product or service (Afuah 2004). Moreover, it can be considered as the expression of how organizational variables are set, how a company structures its relationships

with external stakeholders, and the consequences of this variables and relationships on the company economic and financial performance (Saebi & Foss 2015). 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, a business model includes the following components: a value proposition (Chesbrough 2007); a revenue model adopted to gain a share of the value created (Amit & Zott 2001); a value chain including key resources, key processes and key partners; and finally a cost structure.

To represent, describe, and analyze all the elements of a business model, several concepts are available in literature (Gordijn & Akkermans 2001; Hedman & Kalling 2003; Morris et al. 2005; Osterwalder & Pigneur 2010). Traditional business model concepts present some drawbacks. Most business model concepts give somewhat a static rendition of how companies actually make profits. However, firms compete in changing and often turbulent markets, and therefore need to continuously improve and reshape their business models (Trkman et al. 2015), performing decision-making processes on different levels. Hence, a business model should integrate strategic considerations, operational processes, and decisions related to economics, and its funding elements should guide operational decision making and the firm's strategic direction (Morris et al. 2005). A business model concept also fails sometimes to depict the dynamic changes that occur at a firm-level, and how business model principles guide the decision-making of the stakeholders. Another major drawback of business model concepts is their focus on the architecture of the system, rather than explaining the dynamics between the components of the system (Westerlund et al. 2014). This issue becomes even more cogent where the system at stake is not a single company but a network of enterprises, such as the case with CL systems.

**Business ecosystem**

Theoretical and practical frameworks for designing and assessing business models and decisions "assume that the strategic outcome can be defined independently of the reactions of other players" (Tian et al., 2008). However, a key challenge that is not completely dealt with the business model concept lies in characterizing the relationships among business entities, and understanding how decisions taken by one entity affect other interrelated entities (Tian et al. 2008). In some sectors, companies intermingle to provide services, thus taking the form of business ecosystems (or network). The term business ecosystem originates from ecology, depicting biological ecosystems as complex system of organisms and relationships amongst them (Battistella et al. 2013). A business ecosystem is a network of interrelated business entities, in which "firms interact in complex ways, and the health and performance of each firm is dependent on the health and performance of the whole. Firms (….) are therefore simultaneously influenced by their internal capabilities and by their complex interactions with the rest of the ecosystem" (Iansiti & Levien 2004). Business ecosystem are characterized by value transfer and value co-creation mechanisms (Wang et al. 2015), operational transactions and interdependencies between business entities (Solaimani et al. 2015). Business entities can at the same time co-operate, to improve the growth of the business ecosystem, and compete for market shares (Battistella et al. 2013).

In the literature, several tools help modelling business ecosystems and analyze the impacts of different business decisions taken by the business entities operating within the business ecosystem. A dynamic and evolutionary approach to business ecosystem design and analysis is provided by the role-based modelling approach (Tian et al. 2008; Ok et al. 2013). In this ecosystem modelling framework, business entities can play multiple roles and make decisions reacting to the changes in the ecosystem over time, and based on their objectives, information, and constraints.

The role-based modelling approach to ecosystem business model seem to be suitable for the purpose of CL system business modelling for several reasons. First, it allows to unpack the CL

system down to its main component and functions so to underline their relationship and the value creating mechanisms generated among them. Second, the evident separation between business entities and their functions (i.e. roles) enables a certain degree of freedom to design and assess different business model configuration where business entities play different roles and the same role can be played by several business entities alternatively. This further enhances the transferability of the ecosystem concept to the available city logistics projects and initiatives. Third, the inclusion of metrics to measure the performance of each role enables the modeler to incorporate the decision-making criteria of the business entities for role assignment purposes.

### Role-based networks and ecosystems

The concept of roles within a network of companies has been used in different research streams, such as closed-loop supply chains (Savaskan et al., 2004), supply network management (Harland & Knight 2001) or the management of innovation (Story et al. 2011). The basic notion of roles underlines that companies perform different functions within a network of companies (Pohlen & Farris, 1992) and that an actor performs a specific role when necessary (Story et al. 2011). However, most authors agree that it is possible to some extent to single out the best actor to perform a certain role better than others, through either qualitative inquiry or mathematical estimation (Savaskan et al., 2004). Harland & Knight (2001) stress that it is necessary to understand and develop roles specific competences in order to be proactive in the network. The authors also argue that organization can adjust the role played in managing the network, and either respond to some impacting factors by taking on different roles. As a consequence, different actors taking on the same role would yield different impacts on the overall network profit.

Roles are a bundle of different functions, but since companies can perform similar functions the distinction between the roles can be somewhat blurred, and this could generate problems and conflicts between actors. In the proposed CL role-based business model framework, an effort is posed on overcoming this issue by sharpening the definitions of role so to create clear boundaries between them.

## THE CL BUSINESS MODEL FRAMEWORK: ROLES, BUSINESS ENTITIES AND VALUE EXCHANGES

The CL role-based business model framework follows the business ecosystem analysis and modeling (BEAM) approach by Tian et al. (2008). The framework is built for defining and structuring a wide range of business model configuration of roles and business entities in a CL system. The main pillars of this framework are *Roles and Business Entities (BE).* Roles are a composition of activities, decision, and metrics. To be more specific, Role *k* is defined as

$$R_k = (\{A_i : r(A_i) = R_k\}; \{D_i : r(D_i) = R_k\}; \{M_i : r(M_i) = R_k\}) \quad (1)$$

Where, $r(A_i)$, $r(D_i)$, and $r(M_i)$ represent the role associated with activity $A_i$ , decision $D_i$ , and metrics $M_i$.

Business entities can play multiple roles inheriting the role's specific activities, decisions and metrics, but they also have entity-specific attributes and relationships. This allows BEs to compete or cooperate with other BEs based on their performance analysis of the roles they are playing. BEs aim at optimizing resources, perform activities and provide value-added services to other BEs. Moreover, they pursue short term or long term objectives. For example, a satisfactory (although not comprehensive) list of objectives could be:

- maximize their economic and operational performance;
- increase the number of partnerships with other Bes;

- increase the customer base and revenues, by consistently delivering their value proposition or try new services;
- increase the brand recognition and acquire a green image.

The business model of a business entity (BE) is identified with the set of roles the BE is playing and its relationship with other business entities in terms of value exchanges. For instance, a traditional logistics service provider that normally provides logistics services to shippers and retailers will combine the roles of goods consolidation, pre-retail logistics service provider (e.g. packaging, labeling), city delivery, and either long distance transportation first hand or by outsourcing as a freight forwarder (i.e. user of transportation services) (PIT Logistics Consultancy 2016). Then, since roles can be played by different BEs, the functions and activities performed by a business entity may overlap with those of other entities. This will lead to the coexistence of different business models in the system, such as the case with multiple traditional LSPs operating for different customers in the same city.

The theoretical and practical underpinnings of the roles definition within a CL system are multiple:

1. The whole set of available roles must compose a physical representation of the overall logistics process of door-to-door delivery from the supplier to the receiver in urban areas.
2. Two type of roles are present: provider roles and user roles. Provider roles target customers with their services and value generation, and set cost and level of the service. User decides whether to adopt the logistics services by evaluating the potential benefits.
3. The boundaries between the roles have to be defined in a clear-cut way so to identify the most basic elements of a CL ecosystem that are still capable of providing value to the ecosystem and entice BEs to develop a sustainable business model around them.
4. New CL operators such as Urban Distribution Centers, green delivery operators, micro-consolidation centers or ICT logistics management platforms fit in the system as BEs that provide value added services to other BEs either by either improving role performance or creating new logistics value and business relationships.

In a business ecosystem, the interrelations between resources, activities, and decisions are fundamental. As anticipated, a BE performs activities and requires investment in resources to build a business model. The specific business model determines which BE takes certain decisions and the partnership model. These decisions have an impact on activity execution, and the BEs can evaluate their performance by using metrics.

Table 1 Components of the CL business model framework

| Component | Definition | Properties |
|---|---|---|
| Resources | Resources are owned by the business entities and are necessary for the CL roles to be performed. | *Owner*<br>*Unit cost* |
| Activities | Tasks that use resources and are characteristics of a role. The same activity can not belong to multiple roles. | *Resource consumption* |
| Metrics | KPI measuring a certain business object, namely activities, resources, value exchange, business entity, ecosystem. Metrics are relevant because performance measurement can steer the decisions of BEs. | *Business object*<br>*Value* |
| Decisions | BEs make operative and economic decisions in the fulfillment of their roles, based on a set of constraints, variables, decision parameters. | *Objective*<br>*Decision variable set*<br>*Constraint set* |
| Value exchanges | Both business entities and the roles played by them represent a value network in which three type of values are exchanged: goods, services and revenues, information and intangible benefits (Allee 2008). | *Provider and receiver*<br>*Type* |

Not all assignments are feasible in a CL business ecosystem. For instance, local administrations do not act as logistics service providers, as much as express couriers and freight carriers will not act as the final receiver of the goods. Table 2 shows the possible association business entities-roles:

Table 2 Role assignment matrix

| Business Entity / Role | Express courier | City Freight carrier | Green delivery operator | UCC operator | Supplier | Large retailer | Local retailer | Local administration | ICT platform operator | Real estate developer |
|---|---|---|---|---|---|---|---|---|---|---|
| Receiver | | | | X | | X | X | X | | |
| User of goods consolidation and logistics service | X | | | | X | X | X | X | | X |
| User of city delivery services | X | | | | X | X | X | | | |
| City delivery | | | X | X | X | X | | | | |
| Goods consolidation and logistics service provider | X | | X | X | | | | | | |
| Network coordination | X | | | X | | | | X | X | X |

All potential configurations of a CL system are embedded within this role assignment matrix. Each system consists of a set of BEs, Roles and assignment of BEs to the roles, and it represents only one possible configuration of the system's stakeholders and interactions. However, while CL systems most of the time consist of a subset of BEs, they need to comprise all the roles identified in the matrix.

Goods and services flow between BEs in return for revenues, since BEs own monetary resources, enter into logistics contracts and acquire services from other BEs. Then, the value exchanges of money, goods and services, as well as the intangible benefits (e.g. value proposition) are dependent on the role assignment, and are thus created (or co-created) and exchanged during the actual execution of the roles.

The assignment mechanism works as follows:

1. Business Entity A offers a logistics service to Business Entity B by performing a specific Role, such as, for instance, "Goods consolidation and logistics service provider";
2. Business Entity A sets the price and level of the service. Through the logistics service offered, Business Entity A aims at delivering a set of intangible benefits to Business Entity B. In fact, a profitable supplier-customer relationship is enhanced if the supplier is able to provide Intangible benefits to their customers.
3. Similarly, Business Entity B is seeking after a set of intangible benefits, and Business Entity A will be better off if it is able to provide those benefits by effectively perform the "Goods consolidation and logistics service provider" role;
4. If Business Entity B evaluates positively the offer of logistics service by Business Entity A, a contractual relationship is established among the two BEs. The contract includes the cost and level of the service, and the length of the contract.
5. Business Entity B will then play the counterpart of the role played by Business Entity A. In the example, a contractual relationship is thus substantiated when Business Entity

A and B perform the roles “Goods consolidation and logistics service provider” and “User of goods consolidation and logistics services” respectively;

6. Logistics services exchanged among BEs usually also include exchange of goods. Since the relationship among BEs is substantiated through role playing, the physical flow of goods takes place across the role boundaries.

A high level depiction of the role based view of CL is shown in Figure 1.

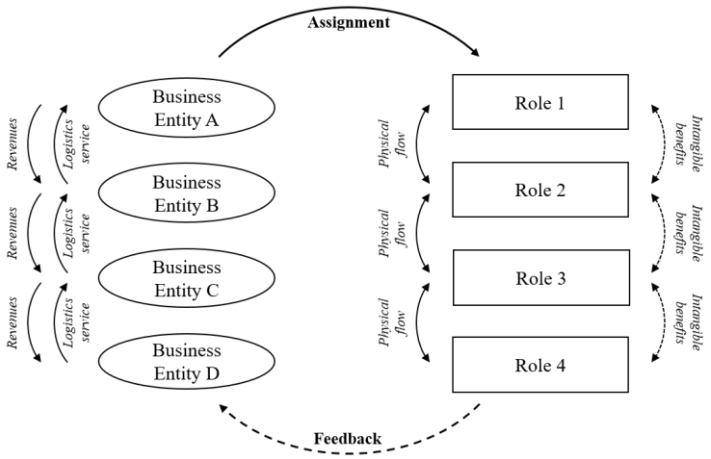


Figure 1 Roles, BEs and flows

## CITY LOGISTICS CONCEPTS AND ROLE ASSIGNMENT

Some caveats are needed for the CL business model framework to truthfully represent a CL system:

- Each CL configuration must comprise the following basic logistics services:
  - Delivery of goods from suppliers to a distribution center located in the outskirts;
  - Goods consolidation through cross-docking goods from different suppliers, assignment to freight vehicle and delivery routes planning;
  - City delivery with light commercial vehicles, which can be either traditional engines vehicles, electric or other environmentally sustainable vehicles
- Relationship between Business Entities are underlined by contracts, and entail transaction costs and opportunity costs that need to be taken into account when new configuration are setup.
- Intangible benefits are delivered by BEs to other BEs through their role performance. Intangible benefits derive from the level of service, and therefore when a new BE is taking on a role played by another BE she needs to organize her resources to deliver at least the same level of service.
- If the same role is played by two BEs, they can coordinate, compete or perform different activities belonging to the role.
- When a new BEs enters the market, inevitably, she will take on one or more existing roles and hence the number of role assignment will increase. For each increase in the role assignment set, an equivalent increase in the Network Coordination role is associated.
- A role shift might happen for the following reasons. First, some roles are not profitable if taken on by certain BEs, and thus other BEs with better profitability seize the opportunity of delivering new services. Second, BEs can improve the performance of a role in terms of level of service and therefore increase the tangible benefits delivered to other stakeholders in the network.

- When a BE takes on a role, more resources are required to maintain the level of service, thus leading to higher costs. In case of a role of service provider, this equals to investing resources or deploying more personnel. In case of a User role, this means that an incremental payment for a new logistics service is due.

Three existing CL concepts are represented to provide insights into how the CL business model framework can be adopted. Data and information for the case studies have been retrieved from the literature (Van Rooijen & Quak 2010; TRAILBLAZER, 2010; van Duin et al., 2016), company reports and interviews with the stakeholders involved.

**Parcel lockers installation: MyPUP**

The first example shows a case of a new BE operating a network of parcel lockers located in the cities of Amsterdam and Nieuwegein (both in the Netherlands), namely MyPUP[1]. After signing up, customers make their online purchase and enter a delivery address provided by the company (i.e. their distribution centre) and receive a code to open the box containing their package. Couriers then deliver goods to MyPUP's distribution centre on behalf of the shippers. Usually these companies guarantee for tight delivery schedules, as they offer same-day delivery (i.e. customers can pick up their purchase before 17). MyPup targets big employers as customers by installing parcel lockers inside major office buildings. The value proposition lies on the ground that if employees ship their items to an unmanned automated locker it will relieve the additional workload at the reception desk of the employer. On the operational side, MyPUP owns and operates its distribution centre as well as a vehicle fleet in Amsterdam. This is going to change soon as the company is planning to outsource all its city delivery operations to Van Straaten Post.

In this system configuration, MyPUP is acting not only as a cross-docking decoupling point at its distribution centre, but also as a receiver through the parcel lockers. It has to be noted that associating the role of receiver to the same company that provides the delivery service is consistent with the industry practice. In fact, the delivery process under the responsibility of express couriers ends as soon as the goods are correctly inserted in the parcel locker. MyPUP is therefore competing with the same role as the Express Couriers by adding an additional consolidation point and introducing a new customer in the network, namely the employer. Express Couriers thus cease to act as user of city delivery services, since the delivery process under their responsibility ends at the MyPUP distribution center (Table 3).

Table 3 Role assignment, MyPUP

| Entity / Role | Express couriers | City Freight carrier | UCC operator | Online retailers | Real estate developer |
|---|---|---|---|---|---|
| Receiver | | | X | | |
| User of goods consolidation | | | | X | X |
| User of city delivery (CD) services | | | X | | |
| City delivery (CD) | | X | X | | |
| Goods consolidation | | X | X | | |
| Network coordination | X | | X | | |

It is clear in this case that all roles are being played by at least one BE, and that the new operator in the system adds complexity to the system by taking on multiple roles at once. Therefore, it is important to highlight the consequences of these role shifts at the BE level. For instance,

[1] https://www.mypup.nl/en

MyPUP has to invest in parcel lockers and distribution centres. Employers become potential users of logistics services and are called to make a decision on the instalment of MyPUP parcel lockers in exchange for a monthly fee.
The interactions between BEs are also subjected to the perturbation brought by the new business model configuration. First, new freight delivery contracts have to be signed between MyPUP and Van Straaten Post. Second, MyPUP and the Express Couriers delivering goods on behalf of the shippers need to find some form of agreements as to the daily arrival time of the goods at the MyPUP distribution centres. As a matter of fact, MyPUP can provide same-day delivery only if Express Couriers are committed to deliver the parcels by 17:00. This kind of commitment can also be enforced if mutual benefits derive from the MyPUP service to both MyPUP and Express couriers. For instance, couriers might benefit as they disengage from the last leg of the delivery process which accounts for a large share of the total logistics cost. However, with the introduction of a new BE and new service the importance of the Network coordination role increases, and this increase is borne also by Express Couriers, who have to provide reliable and timely information on the vehicle arrival to MyPUP. Moreover, both Express Couriers and MyPUP need to integrate their ICT systems. These considerations are shown in Table 4. Figure 2 depicts the overview of MyPUP business model.

Table 4 Role shift in the MyPUP case

| Role | Business Entity (existing configuration) | Business Entity (new configuration) | Main changes |
|---|---|---|---|
| Receiver | Employer | MyPUP | Investment in parcel lockers |
| User of goods consolidation | Online retailer<br>Final customer | Online retailer<br>Final customer<br>Employer | Decision to adopt MyPUP service<br>Monthly fee from Employer |
| User of CD services | Express courier | MyPUP | New freight delivery contracts are signed |
| City delivery | City freight carriers | MyPUP<br>Van Straaten Post | |
| Goods consolidation | Express courier | MyPUP | Investment in distribution centers |
| Network coordination | Express courier | Express courier<br>MyPUP | Commitment to punctuality<br>Information sharing<br>ICT systems integration |

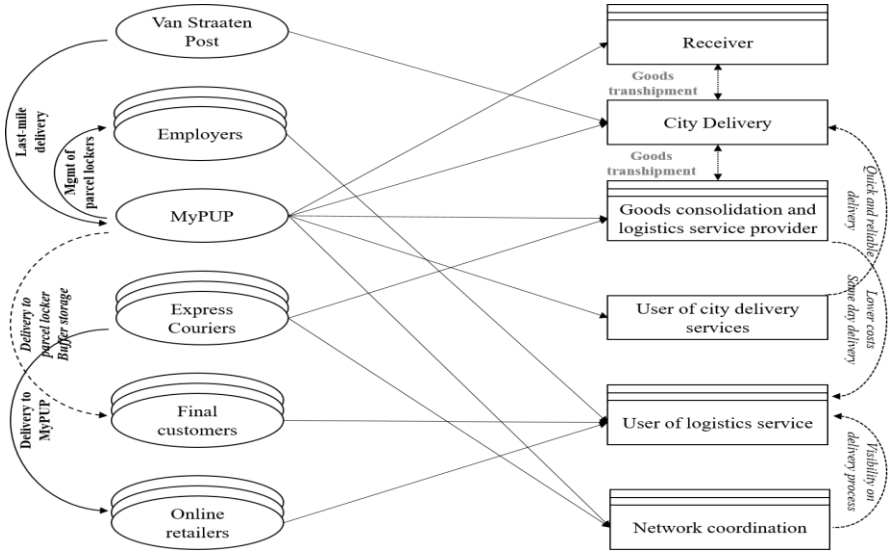

Figure 2 MyPUP ecosystem business model configuration

Three considerations can be drawn:

- MyPUP offers a service to a combination of users. In fact, it relieves the employer from the inbound operations and it delivers to the parcel lockers to generate "buffer storage" for the final customers. However, only employers pay for MyPUP services;
- The number of roles played by MyPUP increases the complexity of the systems, and reflects on all roles. In particular, Network coordination gains relevance as it is played by two BEs;
- There is no direct connection between MyPUP and the Express Couriers in terms of services and revenues. This can represent a potential shortcoming of the proposed business model since they have to jointly coordinate the logistics network;

At the physical network level where the roles interconnect and goods flow, the role-shift paradigm has its counterpart at the activity level. The major changes in this case take place within the roles of Receiver, User of goods consolidation and logistics services, and Network coordination.

**Urban Consolidation Centres**

*Bristol UCC*: this is a consolidation center set up by the local city council and operated by DHL Exel, a subsidiary of DHL. The UCC consolidates goods destined to retailers in the Central Business District (CBD), and then it operates an electric vehicle fleet to deliver them at the shops in the CBD. Besides subsidies provided by the local city council, which accounts for 45% of operative costs, the revenue streams come from retailers and express couriers. However, even though these stakeholders pay the same delivery fee for the last-mile delivery (12 pound/pallet or 9.75 pund/cage), the logic behind the two revenue streams differ completely. In fact, for express couriers this represent a business-as-usual situation, where they outsource the last-mile delivery to a freight carrier. Local retailers instead pay the last-mile delivery service by the UCC as a "reimbursement" for the real service, which is the extra storage provided by the UCC associated with the flexibility of deliveries. The delivery fees are kept competitive to increase the attractiveness to the customers; this price competitiveness however could be put in jeopardy once subsidies are terminated.

The UCC operator obviously takes on the role of logistics service provider, integrating it with the city delivery role. Consequently, express couriers become user of city delivery services offered by this new BE. The local administration provides subsidies to the UCC and thus can be considered as a user of its services. This link is debatable since there are no actual logistics services exchanged; however, the UCC could bring intangible benefits that translates into a service to the local administration, under the form of a reduction in the number of freight vehicles in the city (Table 5).

Table 5 Role assignment, UCC Bristol

| Entity / Role | Express couriers | UCC operator | Local retailers | Suppliers | Local administration |
|---|---|---|---|---|---|
| Receiver | | | X | | |
| User of goods consolidation | | | X | X | X |
| User of CD services | X | | X | | |
| City delivery | | X | | | |
| Goods consolidation | X | X | | | |
| Network coordination | X | X | | | |

In this case, therefore, the same network coordination mechanism apply. In addition, new freight contracts are signed, and the UCC operator has to invest in a vehicle fleet. This may lead to conflicts with the existing freight carriers. The business model of this UCC is relatively complex, as multiple stakeholders are involved in the revenue stream to the UCC operator. Table 6 and Figure 3 depicts the major role shifts and the overall business model.

Table 6 Role shift in Bristol UCC

| Role | BE (existing configuration) | BE (new configuration) | Main changes |
|---|---|---|---|
| Receiver | Local retailers | Local retailers | Less deliveries, less time for handling operations |
| User of goods consolidation | Suppliers | Local retailers<br>Suppliers<br>Local administration | Subsidies |
| User of CD services | Express couriers | Express couriers<br>Local retailers | New freight delivery contracts<br>Lower delivery fee |
| City delivery | City Freight carriers | UCC operator | Investment in vehicles |
| Goods consolidation | Express couriers | UCC operator | Investment in distribution centers |
| Network coordination | Express couriers | Express couriers<br>UCC operator | Commitment to punctuality<br>More information sharing<br>More data processing |

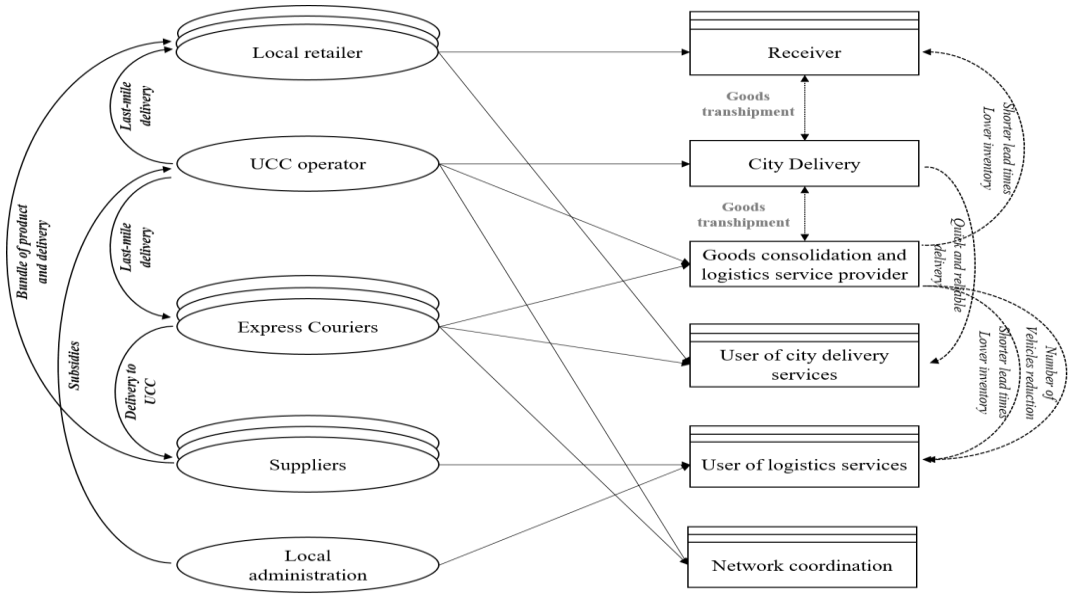

Figure 3 UCC Bristol ecosystem business model configuration

From a business model perspective, the link between the UCC operator and the Local Administration is rooted only in the intangible benefits that are potentially achievable rather than in an actual exchange of services. This shortcoming could be resolved if, theoretically, the UCC would commit to an annual objective of reduction in the number of vehicles. Moreover, there are some potential shortcomings on the local retailers' side. First, given the fact that they pay for the last-mile delivery on top of the delivery from the shipper to the UCC, they could maintain the same overall delivery cost only as they are able to renegotiate the delivery price to the UCC with shippers and express couriers. Second, while they benefit for goods consolidation at the UCC they do not pay for this service.

*Binnenstadservice:* Binnenstadservice is a company operating a network of urban consolidation centers in Dutch cities. It focuses on offering goods consolidation and other logistics services (e.g. delayed cross-docking, home deliveries, waste returns) to small local retailers. Retailer pay a basic membership cost between 30 to 50 euros per month, and an additional cost for the extra logistics services. The last-mile delivery is outsourced to freight carriers at 3.75 euro per stop. Moreover, Binnenstadservice aims to target shipper by offering them an ICT system integration package[2] that

[2] https://www.mixmovematch.com

provides a single interface to receive real time Proof of Delivery (POD) for all their shipments and enables them to combine shipments per geographical areas (Table 7).

Table 7 Binnenstadservice role assignment

| Entity / Role | Express couriers | City Freight carriers | UCC operator | Local retailers | Suppliers |
|---|---|---|---|---|---|
| Receiver | | | | X | |
| User of goods consolidation | | | | X | X |
| User of CD services | | | X | | |
| City delivery | | X | | | |
| Goods consolidation | X | | X | | |
| Network coordination | X | | X | | |

Binnenstadservice acts as logistics service provider and organizes the last-mile delivery process, as in the MyPUP case. As in the previous UCC case, both Binnenstadservice and the express couriers perform the role of goods consolidation and logistics service provider. Finally, local retailers can take advantage of a decreased number of deliveries and a lower inventory, which are typical benefits of a receiver, by being proactive and shifting towards the role of logistics services' users. Moreover, Network coordination is a role where Binnenstadservice, together with an ICT partner, put considerable effort in order to offer a valuable service and provide intangible benefits to shippers. The main components of Binnenstadservice business model are shown in Table 8 and Figure 4.

Table 8 Role shift in Binnenstadservice

| Role | BE (existing configuration) | BE (new configuration) | Main changes |
|---|---|---|---|
| Receiver | Local retailers | Local retailers | Less deliveries<br>Lower inventory |
| User of goods consolidation | Suppliers | Local retailers<br>Suppliers | Membership fee<br>Extra value added services |
| User of CD services | Express couriers | UCC operator | New freight delivery contracts |
| City delivery | City Freight carriers | City Freight carriers | |
| Goods consolidation | Express couriers | UCC operator | Investment in distribution centers |
| Network coordination | Express couriers | Express couriers<br>UCC operator | Systems integration<br>More information sharing<br>More data processing |

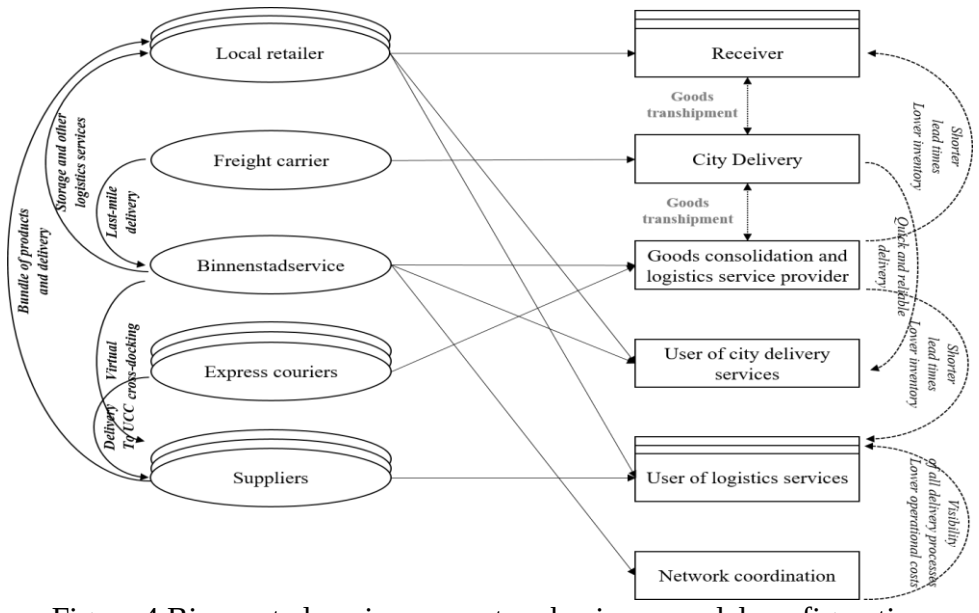


Figure 4 Binnenstadservice ecosystem business model configuration

### Consideration

The previous cases represent different possible configurations for a CL systems new business model. MyPUP is one example of such new business models. The company takes advantage of the fact that it is not profitable for employers to act as receiver, since it is not rewarding for them and it generates hidden costs of inbound operations. The key to become profitable and attractive towards employers is to evaluate correctly the value of the solution from the employers' point of view, and propose a service fee lower than that value. Furthermore, MyPUP becomes a logistics service provider, competing with larger firms. The decisive factor here instead is to improve the goods consolidation and logistics service provider role performance, and find a coordination mechanism with the express couriers in absence of a contractual agreement.

The Bristol UCC operator aims at financial sustainability by gaining revenue from multiple sources, including the couriers. However, there is no clear business model innovation and additional value provided to the couriers. Taking into account the door-to-door delivery process, the Bristol UCC acts as an additional decoupling point bearing operational costs without additional value to exchange for higher revenues. Moreover, the UCC operator performs the role of city delivery and offer the service to the local retailers, which have already paid for a part of the delivery process and are not always able to negotiate a reduction of delivery fees with shippers and couriers. Hence, acting as both logistics service provider and city delivery might not yield good sustainability of business model. Being valuable towards retailers and receiving revenues from them for this value might be the possible solution for a sustainable business model, as in the case of Binnenstadservice.

A very important role that each of the previous new BEs had to perform and develop skills and resources for is Network coordination. As previously mentioned, when the complexity and number of the linkages among BEs and roles increases Network coordination ensures that the delivery goes as smoothly as possible and different supply chains integrate seamlessly. On the operational side, it is often required that new BEs develop integrated ICT platform from scratch. Network coordination does not only help stakeholders to switch to the new business model, but could also provide additional value and constitute a profitable service, as in the case of Binnenstadservice.

## CONCLUSIONS

From a theoretical point of view, the CL business model framework presented is a qualitative tool that aims to respond to the shortcomings of traditional business model concepts adopted in CL literature. One of the main contribution associated with the role-based viewpoint, and conveyed through the Role assignment matrix, lies in the possibility to understand, represent and ultimately evaluate different configuration of the same CL concept. It depicts the dynamics between the components of the system, namely the interrelations between BEs and Roles, in addition to portraying a snapshot of the architecture of the system. Furthermore, it creates links among decisions that are taken by different stakeholders and at different level of granularity of the system. In this sense, by using the CL business model framework it is possible to draw the implications of higher level business decisions on the operational processes of a CL system. This linkage works both ways, as the decision from a Business Entity to take on a role and sign new logistics contracts should take into account the operational aspects entailed with that specific role.

From a practical point of view, a major contribution of the proposed CL ecosystem business model framework lies in the fact that it assesses the feasibility of a network configuration rather than a specific measure. One important advantage of this consideration is that it provides an evaluation tool able to go beyond the context in which the CL measure is implemented e.g. geographical are, demand, location of customers, revenue model, operational model. Finally, CL stakeholders could make use of a future ABM implementation to evaluate quantitatively the

outcomes of their business decisions. A cooperative gaming approach could further enhance their knowledge of the interrelations among firms and the implications of business strategies and decisions along the CL network.

Finally, this work bears future research implications as it aims to set the theoretical foundations to a greater effort of evaluating CL concepts both qualitatively and quantitatively taking into account their business model. Agent-based modeling (ABM) is deemed to be the suitable modelling and simulation tool to integrate the proposed qualitative role-based ecosystem BM approach, by modelling CL through a set of inter-connected agents (i.e. stakeholders) and their mutual interactions.

Some challenges and limitations of the proposed framework are noteworthy and allow for further research on the issue. First, while the identification of roles metrics is quite straightforward when they are concerned with tangible objects such as services and resources, it is much more complex when intangible benefits are exchanged between roles and business entities. Then, the value of information is not properly assessed and information only serve as constraints to the role assignment procedure. Information exchange are important because they can both influence the performance of some roles up to the point that some assignment are not feasible. As a matter of fact, BEs require certain type of information to perform specific roles. However, the implication for the role assignment of the value of information are not assessed in this paper and provide for an interesting further development.

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