Business Model Scenarios for an Open Service Platform for Multi-Modal Electric Vehicle Sharing

Uschi Buchinger, Sven Lindmark, Olivier Braet
iMinds-SMIT, Vrije Universiteit Brussel
Brussels, Belgium
e-mail: uschi.buchinger@iminds.be, sven.lindmark@iminds.be, olivier.braet@vub.ac.be

***Abstract*—Triggered by environmental concerns, smart mobility solutions have expanded in recent years. This includes the development of an electric vehicle market, car- and bike sharing concepts and better route planning systems for public transportation. The fusion of these approaches opens the door for new business models for cooperating industries in the field of multi-modal electric mobility. This paper provides a selection of scenarios about how the interplay between mobility- and infrastructure providers can affect their business models. It concludes that the continuous technical and business interactions between multiple partners would profit from the integration of an Open Service Platform that handles data management and coordination tasks for the partners.**

Keywords-Business models; Electric vehicles; Charging infrastructure

I. INTRODUCTION

Triggered by climate change and global resource shortages, the transportation industry faces times of changes. As a consequence, there is an increased industry and policy interest to develop and improve *electric vehicles* (EVs) and make them more commercially viable [1], [2], [3].

But the EV industry is confronted with many challenges of technical, economical, organizational and social nature. Customers are skeptical regarding long charging times, short driving range or the height of initial investments for the vehicles or components such as the rechargeable batteries. The fragmentation of players on the supply side (battery provider, car manufacturer, infrastructure provider, etc.) causes a lack of a single point of sale, which creates additional hurdles for customer adoption [4], [5].

These challenges can be addressed in many ways. Some approaches have arisen in the mobility industry including i) better utilization of vehicle capacity through leasing, sharing and co-using programs [6] and ii) the development of smart *Information and Communication Technology* (ICT) systems. By being able to consult smart technology previous to the journey, wayside and on board (e.g., while driving via roadside information panels), integrated multi-modal traveling and the easy changing of transport systems is facilitated [6], [7].

Kley et al. [8] classify all these emerging trends in the electric mobility sector in three segments: vehicle and battery, infrastructure, and system services (or integration into the energy system).

Earlier studies, such as the EURELECTRIC concept paper [19], and the report on Electric Vehicles in Urban Europe [20] analyzed various market models, key players and B2B cooperation in these segments. Thereby they define the requirements for the expansion of an electric vehicle market. However, there is no research on business model of integrative Open Service Platforms (see below).

New technology (platforms) forms a logical next phase by searching for ways to combining the three segments and thereby supporting networked electric mobility patterns.

In Belgium, a personal card where individual transportation contracts can be stored (called MOBIB card), is one of the pioneers of offering a networked mobility solution. It integrates multiple mobility services. However, MOBIB is not focused on electric mobility [9].

Instead, it is the National Railway Company of Belgium (NMBS/SNCB – *Nationale Maatschappij der Belgische Spoorwegen/Société Nationale des Chemins de fer Belges*) that moved forward by creating an *Open Service Platform* (OSP) where various players from the (electric) mobility industries are linked. This includes amongst others car manufacturers, charging pole providers, energy providers and –distributors or mobility data providers. The platform is operated under the name "Olympus" and provides since 2012, services related to namely the sharing of electric cars, scooters and bicycles in four cities of Flanders. Embedded in a test bed, the project aims at generating insights into the market throughout its operation period of three years [10].

Hence, NMBS/SNCB combines two strategic points that are recommended by Shaheen et al. [11] to stimulate the development of the vehicle sharing industry. These include i) the coordination and linkage of several services from the mobility and non-mobility sectors and ii) the incorporation of superior communication, reservation, and billing technologies [11].

The construction of such an Open Service Platform that enables EV-sharing *and* coordination of shared (public) EV-infrastructure requires an adequate service offer to a wide range of partners from all three segments defined before: vehicle and battery, infrastructure and electricity sector. The task that the Olympus platform performs, namely coordination of *EV-sharing and EV infrastructure sharing*, is here abbreviated by EV-I-sharing. Joining such a network necessitates the restructuring of business models for (so far independent) industries. Various options emerge that might

 ISBN: 978-1-61208-282-0

result in the reallocation of control parameters and value creation for the individual partners.

This paper will examine how the business models of existing and new entities in the EV-I-sharing ecosystem could look like. Within this paper, the focus will be on a consumer-oriented approach. The obvious contact points for consumers are either the mobility- or infrastructure sector. Consequently, in this paper, we delimit ourselves from analyzing the electricity or other relevant sectors.

By doing so we will be able to answer the question: How can smart technology enable coordination of existing - and facilitation of new business models in the EV-I-sharing sector in order to provide multi-modal mobility alternatives to end customers.

The paper will use the value network and business model matrix developed by Ballon [12], elaborated in Section II. On the basis of this framework, Section III develops the value network. It will incorporate the actors, tasks or roles and relationships of the mobility and infrastructure sector. It will also introduce the dominant “As-is” business model, i.e., the one operated today by multiple EV-sharing providers and which will serve as a starting point for the introduction of further business model scenarios.

The business models are presented and analyzed in Section IV. In Section V, we compare the different scenarios and give suggestions of their ability of real-life implementation. We end with a conclusion and suggestion for further research in Section VI.

II. METHODOLOGY

In this paper, preceding the description of various business models, the value network of the EV-I-sharing concept will be envisaged. The value network consists of three building blocks: business actors (persons or corporations mobilizing tangible or intangible resources), business roles (business processes fulfilled by one or more actors) and business relationships (the contractual exchanges of products or services for financial payments or other resources; represented through value chains). In this paper, actors are described also as partners.

Based on this generic value network canvas, alternative business model scenarios will be constructed and compared. While there are many business model frameworks proposed in the literature, notably Osterwalder [13] and Chesbrough [14], these are usually more suited for aiding individual firms and less suited for guiding collective innovation processes. It is therefore necessary to consider a stream of research that attempts to provide a more coherent treatment of the most relevant business model parameters while at the same time focusing mainly on the relationships between the stakeholders involved.

Hence, we will follow the framework of Ballon [12], displayed in TABLE I, which defines several parameters upon which business networks can be analyzed. The parameters encompass the value network, the functional architecture and financial model, and value configuration [12], [15].

TABLE I. BUSINESS MODEL MATRIX (SOURCE: [12])

CONTROL PARAMETERS				**VALUE PARAMETERS**			
Value Network Parameters		***Functional Architecture Parameters***		***Financial model Parameters***		***Value Configuration Parameters***	
Combination of Assets		Modularity		Cost (Sharing) Model		Positioning	
Concentrated	Distributed	Modular	Integrated	Concentrated	Distributed	Complement	Substitute
Vertical Integration		Distribution of Intelligence		Revenue Model		User Involvement	
Integrated	Disintegrated	Centralized	Distributed	Direct	Indirect	High	Low
Customer Ownership		Interoperability		Revenue Sharing Model		Intended Value	
Direct	Inter-mediated	Yes	No	Yes	No	Price/Quality	Lock-in

From the given parameters, we chose five upon which the succeeding business models are analyzed. These are the Combination of Assets, Customer Ownership, Distribution of Intelligence, Cost (Sharing) - and Revenue (Sharing) Model.

The five parameters are defined as follows [12]:

Combination of assets is a value network parameter that focuses on the input, usage and combination of resources from all partners.

Customer ownership, also a value network parameter, refers to the relationship with the end customer examining, amongst others, the access to key information of the customer, the type of contact (direct or intermediated), the level of intensity and proximity to the customer.

Distribution of Intelligence belongs to the parameters describing the functional architecture of business networks. In ICT systems, this refers to the distribution of processing power, control and (management of) functionality across the system.

Cost (Sharing) Model and *Revenue (Sharing) Model* are both financial model parameters. The former discusses how costs (investment) for design, development and exploitation of a product or service are shared in the business network. It relates to sunk costs or up-front investment and marginal costs. The latter examines the business model with regard to income streams (direct/indirect) and whether and how revenues are shared. Apart from distribution revenues over several actors, it can also concentrate on one actor.

Considering the information made available by the project partners, these were the parameters on which empirical data could be collected during expert interviews and interactive business modeling workshops. The information gathered during these interactive moments were extended with data gathered from desk research and literature review.

III. EV- AND EV-INFRASTRUCTURE-SHARING

A. Value Network Description

When illustrating the value network of EV-I-sharing, we identified three industrial streams. Each stream focuses on different vertical market segments and consists of the roles that together build the value chains. For the Open Service

Platform (OSP), we distinguished a mobility-, an infrastructure-, and an interactivity- and data stream (Fig.1). Further streams (e.g., electricity) are not considered within the scope of this paper. The value chains of each stream will be divided into three phases: the service development/ creation phase, the service delivery/distribution phase and the service consumption/usage phase.

Firstly, the *mobility stream* comprises the provision of an electric vehicle (e.g., electric cars, bicycles or scooters). In the service delivery phase the “enabling” services precedent to the usage of the EV are placed. They encompass registration of customers, authentication-token provision, reservation of mobility items, billing of customers, clearing tasks and authentication of the token on the spot. The actual usage of the mobility item is the contact point for the customer and is placed in the service usage phase. Roles only describe the task itself, not the specific configuration. For example, “billing” includes all variations and frequency of payment: flat rate fees prior to the usage, during the times of membership (e.g., subscription) or after the usage (e.g., pay-per-use) as well as combinations of these.

Secondly, the *interactivity and data stream* focuses mainly on data gathering and processing and thus represents the application intelligence of a value chain. These data processes actually exist *in* each of the other streams (and even in each role itself). Since this is a layer of intersection, it is however singled out and builds an own stream in this value network. Hence is thus conducted here that data from resources (i.e., vehicles and charging infrastructure equipment), customers and events (i.e., changes in the status of resources) are recorded, aggregated and encoded. Encoded data is edited. Data sharing, extraction, recombination and usage by all business partners happen in the usage phase.

Third, the *infrastructure stream* focuses on EV infrastructure supply, e.g., charging poles and parking facilities. It comprises hardware and software development in the service development phase. Infrastructure deployment/maintenance follows in the service delivery phase. In existing business models of charging pole/parking lot providers, it is not uncommon to have similar procedures in the service delivery phase of the infrastructure stream as in the mobility stream. In public and semi-public parking/charging facilities, EV owners can subscribe for the usage of parking lots/charging poles whereby the parking lot/charging pole providers take care of registration of customers, authentication-token provision, reservation of according items, billing of customers, (clearing tasks in the B2B sector) and authentication of the token on the spot [16].

For simplicity, in our scenarios, the sole initial money flow will come from the customer’s EV usage (mobility stream).

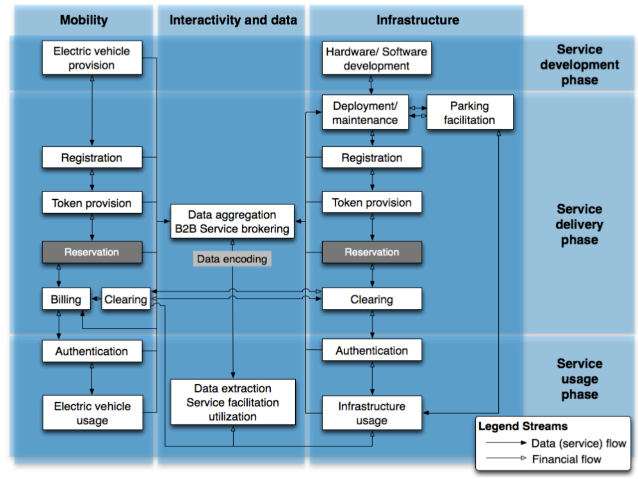

Figure 1. Generic EV- and EV-infrastructure-sharing value network

The costs of the infrastructure provider and other network partners need to be covered by B2B clearing. Data extraction/sharing and infrastructure usage will demand revenue sharing. Along the value chains, data/services flow down (indicated by a filled arrow) while money flows up (indicated by a plain arrow). Fig. 1 illustrates the value network of the EV-I-sharing ecosystem.

In what follows, multiple business models are outlined, mapping various partners, and cooperation between them.

The term ‘infrastructure provider’ will be used for a charging pole/parking lot provider and the term ‘infrastructure’ for charging/parking spots.

B. “As-is” business model

The initial model is applicable to existing EV-sharing concepts (see for example Autolib’ [17] or Zen Car [18]) Tasks of the mobility stream are operated by the mobility provider who registers its own customers, provides a token or access code for the vehicle, handles the reservation process, bills the customers and enables authentication at the resources to unlock/start the vehicle. In this scenario, only the development of infrastructure hardware and software components is outsourced. The mobility provider deploys, manages and maintains acquired charging and parking infrastructure. The execution of enabling services for the infrastructure usage is taken care of by the corresponding ones of the mobility item usage. Data is aggregated in house limited to the mobility provider’s data aggregation system.

For the customer, the procedures of the service delivery phase need revision for each new mobility provider with whom he/she signs a contract. The customer needs to register separately for each mobility provider and can charge the vehicles solely at the declared charging facilities. Fig. 2 illustrates the “As-is” business model. The grey boxes indicate the partners who conduct roles. They consist of the mobility provider, infrastructure provider and customer.

 ISBN: 978-1-61208-282-0

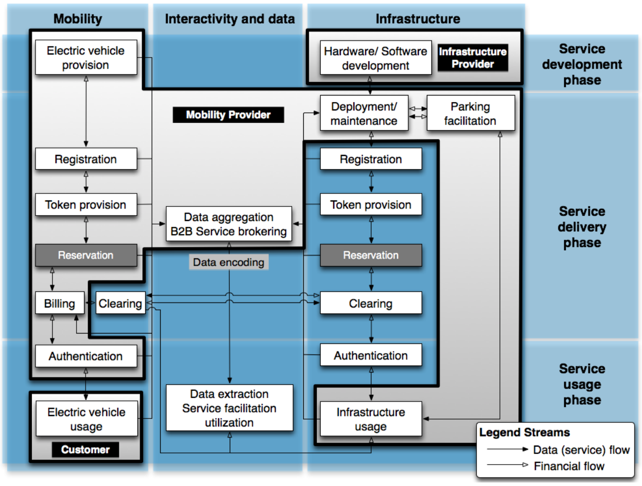

Figure 2. ‘As-is’ business model

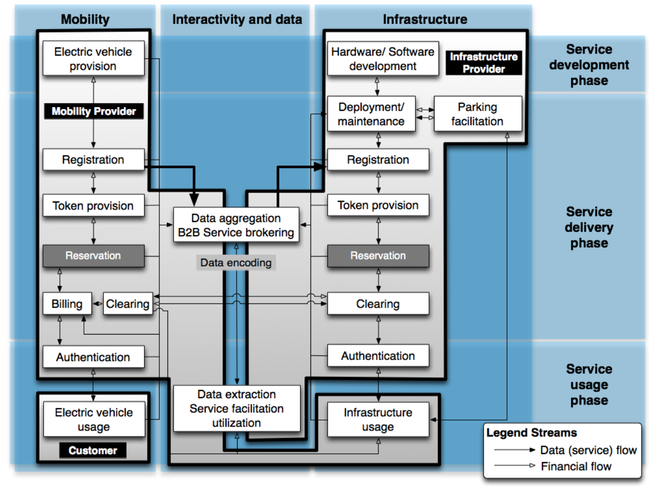

Figure 3. Independent Partner Scenario

The “As-is” business model construe the chosen parameters:

Combination of assets: The mobility provider integrates all relevant assets for the EV-I-sharing process. It buys or licenses charging equipment and parking facilities. Due to the conjunction of vehicles and infrastructure, services in the delivery phase (‘enabling services’) need to be conducted only once. Assets are concentrated.

Customer ownership: Solely the mobility provider has customer ownership.

Distribution of intelligence: Intelligence is concentrated at the mobility provider.

Cost sharing model: There is no cost-sharing model, all (up-front) investment and operating costs are borne by the mobility provider.

Revenue (sharing) model: No revenue sharing model is necessary in the single operator scenario; revenues are concentrated with a single actor.

IV. Business Model Scenarios

The previous section introduced the value network of the EV-I-sharing concept and the established business model of mobility providers.

Taking into account the high of investment and potential risk for each market entrant, business partners might look for cooperation and joint ventures with other partners in the electric mobility sector. Given the possibilities that emerge from the development of smart ICT, this is becoming more and more feasible. We will therefore introduce three business model scenarios where various players are included, namely mobility providers (including, e.g., EV-sharing or -leasing companies), infrastructure providers (parking spot and charging pole providers), the Open Service Platform (OSP) and the customer. The scenarios were selected because of their potential to illustrate sufficiently contrasting industrial options and their coverage of many aspects in the EV-I-sharing scheme.

A. *Independent Partner Scenario*

This scenario assumes that the mobility provider facilitates the usage of other public or semi-public charging/parking spots; other than the own (home) charging/parking spots.

The Independent Partner Scenario illustrated in Fig. 3, shows the setup where two companies (mobility- and infrastructure provider) cooperate, but independently execute the roles of the own value chain. No OSP is included.

The data of a registering customer is automatically or on-demand (if the customer explicitly asks for the service) forwarded to the infrastructure provider. After registering the customer in the own database, the infrastructure provider issues a separate token, enables the customer access to the reservation process (if existent), and facilitates the authentication at the charging pole.

Combination of assets: Resources as well as applications necessary to fulfill the ‘enabling services’ in the service delivery phase are properties of either the mobility provider or infrastructure provider. Each partner aggregates data of resources and events (changing in the status of resources) separately in its system. Only the mobility provider aggregates customer data.

Customer ownership: In this scenario, both partners have customer ownership (the infrastructure provider, e.g., through the provision of the authentication token). The difference is in the billing process; the mobility partner includes this role exclusively in its customer relationship.

Distribution of intelligence: Both partners have their own system of managing the roles along the value chains: their data aggregation pools, processing power and control. Intelligence is distributed in the value network.

Cost sharing model: Each partner is itself responsible for (up-front) investment in design, development and exploitation of products and services that are used in the network. Investments are therefore distributed over various partners.

 ISBN: 978-1-61208-282-0

Revenue (sharing) model: Only the mobility provider is in the position of billing the customer. In the business cooperation, some form of clearing (i.e., revenue sharing) will be necessary to pay the usage of charging poles/parking spots. It is due to bilateral agreements.

While this scenario is suitable for two partners, the more EV-I-sharing industries join the network, the more complex it will become to handle business relationships through bilateral agreements. The complexity rises also for the customer who gets multiple access tokens for EVs and EV-infrastructure. For example he/she might need to swipe a card over a reader for opening a car (provided by the mobility provider) and a different one for stopping the charging process and unplugging the car from the energy system (provided by the infrastructure provider).

B. *Intervening Partner Scenario*

The following variation of the partner model shows how one partner can expand its roles by taking over partner roles in the service delivery phase, as portrayed in Fig. 4. The scenario illustrates the provision of a shared token, meaning that one token of the mobility provider gives access to all infrastructure resources. This actor steers the authentication at the resources.

At the same time the scenario shows a possible way of how the OSP fits in the value network and how it can possibly take over a role in one of the value chains, namely the “registration” of customers for the infrastructure providers. A probable use case should describe this: if a customer registers at the mobility provider the OSP enables that he/she is automatically registered for infrastructure providers’ services.

Second, the OSP collects and passes on all event data in the network. When a vehicle is reserved at the mobility provider, the OSP can coordinate with all infrastructure providers of where and when the vehicle is reserved, what the battery status needs to be, where the vehicle can be plugged at the final destination, etc.

Its main role however is to aggregate events or changes in the status of resources. The OSP collects information about the exact times of the usage of services and resources and acts as a trusted party in the clearing process.

Combination of Assets: The assets are spread between the partners in the system. Whereas the mobility provider (and partly the infrastructure provider) has leading parts, the OSP is mainly a supporting partner.

The mobility provider, apart from allocating resources, has a system for registering new customers. The OSP then collects this data from the initial registering partner (mobility provider) and registers the new customer for partner services. The requirements to make a positive new registration of a customer at a partner service might be more demanding however than the data that is provided by the initial registering actor (e.g., more sophisticated data needed or other registration forms in place). This problem needs to be solved by arrangements between the partners.

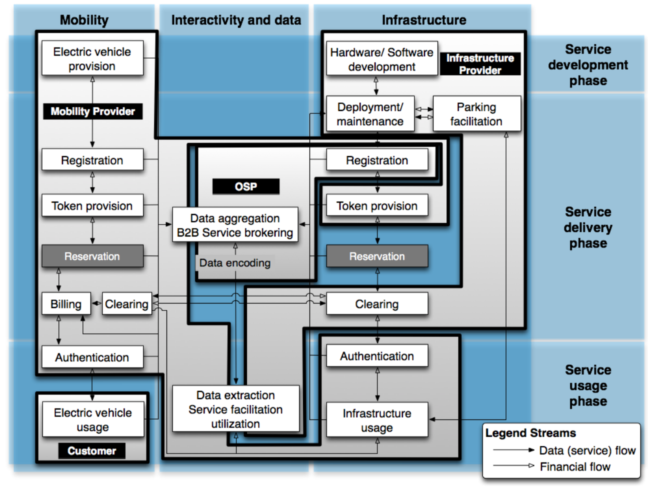

Figure 4. Intervening Partner Scenario

Customer Ownership: The takeover of the registration process of new customers comes with the power over customer data and its processing and forwarding responsibly. In this scenario, solely the mobility provider has direct customer ownership. However, the OSP aggregates customer- and token data collected from all partners.

Distribution of intelligence: Intelligent poles are placed at two edges: the mobility provider that takes over token provision for multiple partners and the OSP that registers customers at partner services. Additionally the OSP collects data of events taking place in the network. By ceding roles to other partners, the infrastructure provider cedes a certain amount of control over certain processes within its value chain.

Cost sharing model: The mobility provider expands its systems in terms of opening token provision system as well as implementing the authentication system backend and on the spot. It might require a large up-front investment. The OSP at the same time needs to invest in a registration system that meets all partner-requirements. Infrastructure providers save costs by not having to develop and maintain customer databases and authentication mechanisms.

Revenue (sharing) model: The income from the usage of the vehicles has to cover the expenses of the infrastructure provider (through bilateral billing agreements) and the Open Service Platform. The mobility provider is the single contact point for the customer; a revenue sharing model must be set up.

Having only two partners in the scenario, an OSP might not be necessary. However, the more partners the ecosystem includes on both sides of the value network, the more complex the scheme with bilateral agreements gets, and the higher the value of a regulatory, coordinating system. When workload and coordination tasks are growing, the OSP can be consulted either for sole data pooling or for fulfilling roles itself.

 ISBN: 978-1-61208-282-0

C. *Open Service Platform Scenario*

The OSP scenario (Fig. 5) shows a model where the OSP is responsible for fulfilling all roles of all partners in the service delivery phase. This is possible due to data exchange between the partners for customers and resources. All data about customers and infrastructure resources (e.g., location, type, availability) is aggregated in the OSP. The business model is depicted on the value network canvas in Fig. 5.

Combination of assets: This model illustrates the centralization of most assets at the OSP. The OSP has to construct (administrative) systems, processes and mechanisms that cover all requirements of the 'enabling services' for both mobility- and infrastructure provider. This raises many challenges. It might be that the applicant is only interested in one or more services of the network but not all that are offered (e.g., only electric bike sharing). It might be that he/she is not entitled to use multiple services (e.g., no driving license). This selection must result in an adjusted registration and invoicing of the customer. The data needs to be reflected on the authentication token. The right modules need to be loaded on the tokens - modules that describe which services are available to the token holder. If he/she subscribed for electric bike sharing, the token shall not give access to, e.g., electric cars.

The mobility provider solely provides EVs. The infrastructure provider is responsible for development, deployment and maintenance of charging poles/parking lots. All other tasks are outsourced to the OSP.

Customer ownership: Neither the mobility- nor the infrastructure provider have direct customer ownership. For the customer, the Open Service Platform appears as the sole service provider.

This can be seen as a form of indirect customer ownership. Registration of new customers is done for all partners in the network that can encompass multiple mobility- and infrastructure providers. Tokens are handed out by the OSP and are valid for all resources. Data from all roles are aggregated by the OSP and can be extracted and used by the partners in the network. Billing of customers and clearing between the partners in the network is conducted by the OSP based on self-generated data. This scenario aims at a single-access-point strategy towards the customer.

Distribution of intelligence: The scenario shows a strongly centralized intelligence in the system architecture. By the aggregation of data, the OSP is competent to control and process most events in the system.

Cost sharing model: The OSP invests in the platform solution for EV-I-sharing concepts regarding customer and infrastructure resource management. Mobility- and infrastructure provider need only to invest in and provide the respective resources.

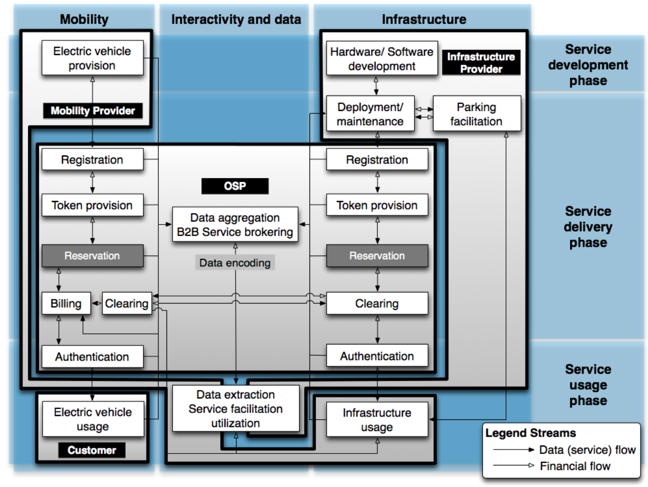

Figure 5. Open Service Platform Scenario

Revenue (sharing) model: Payment for the vehicle usage flows to the OSP instead of the actual service developer (indirect revenue flow). A revenue sharing model must be implemented between the partners.

In this scenario, the OSP is not exclusively a B2B service enabling factor, but an entity in direct contact with the customer. For the mobility- and infrastructure providers, joining such network structure makes them dependent on the performance of the platform. The mobility- and infrastructure providers have no control over systems, processes and mechanism of the customer relationship. For this matter, as for the questions of clearing, a strong and trusted partnership and a high level of transparency are necessary. It is unlikely that partners agree to such a structure where they have only a minimum of control. It needs to be stated however that this represents an extreme scenario and less extreme variations are possible. Nevertheless, from joining such a centrally controlled network, partners profit from the opening of service to a broad customer base and thus a potentially higher usage.

V. BUSINESS SCENARIO COMPARISON

In TABLE II, a contrasting comparison of the different models that were presented in Section IV is given, rated on the five Business model parameters. Some additional dimensions that emerged in the analytical process are included and rated at the end of the table. They can be mainly affiliated to a dominant parameter that indicates their probability and value in the network. This is expressed with plus and minus.

First it is the *suitability of integrating more partners* in the network. This mainly depends on the openness of the network and the intelligence of the system. The integration of the OSP is an indicator that systems are open and thus capable to integrate and coordinate multiple network partners and their technical standards. Contrary, if system intelligence is centralized either at a mobility- or infrastructure provider, new entrants will likely have to adapt and synchronize their systems. This can be an entrance barrier.

 ISBN: 978-1-61208-282-0

Independency of partners refers to the range of roles and level of vertical integration one partner has to cede to other network partners. The more roles are taken over by one entity the more dependent are the others on its performance.

Ease/Simplicity for customers rates the level of difficulty for the customer to understand the service infrastructure and his/her possibilities of how and what to use it for. Issuing multiple access tokens decreases for example the usability contrary to using one access token for all resources. This applies for all service deliveries towards the customer. The more partners have direct customer ownership, the higher the level of complexity.

Service offer towards customers rates the options for the customer for each scenario. The more partners that are (or can easily be integrated) in the network, the bigger the range of service options for the customer.

VI. CONCLUSIONS AND RECOMMENDATIONS

This paper illustrated the value network and various possible business models for EV-sharing and coordination of shared EV infrastructure. On a generic value network canvas, four business model scenarios were illustrated that describe possible variations of the interplay between the partners with the focus on mobility- and infrastructure providers.

For each scenario we analysed the impact on five different business model parameters: Combination of Assets, Customer Ownership, Distribution of Intelligence, Cost (Sharing) Model and Revenue (Sharing) Model. Additionally each concept was analyzed upon the suitability of integrating more partners, independency of partners, ease/simplicity for customers and service offer towards customers.

Following the comparison of the scenarios, we conclude that the more partners in the network that conduct the same roles for EV-sharing and the coordination of infrastructure, the larger the need for an central intelligence system. A coordinating Open Service Platform can therefore be integrated either as a pure data hub or as a partner that takes over roles itself in the value network. Dependent on the level of control the partners are willing to cede and the perceived value coming with this, an OSP scheme is feasible that has the power to establish a smart sharing network, open enough to include further players from the sector. The authors infer that the more partners are to be coordinated in the network, the higher the incentives to have a centralized intelligence and data exchange system – thus an OSP.

In conclusion, this paper serves as an approach of how mobility and infrastructure provider can coordinate services to enable a united, attractive multi-modal mobility offer to the customer.

Further research is required when it comes to the implementation of additional value streams, as for example, the electricity sector as well as the outlining of further business model scenarios. Such research should include also investigations into the acceptance and usage of such EV-I-sharing concept by the end-user. Second the aspect of handling data is a topic for further research. It needs to be stated that the OSP scheme requires the implementation of data protection- and security standards. Appropriate measures need to be implemented in the intelligence system. It is thus a question of further analysis of who can implement adequate technical systems to guarantee these standards and which requirements these standards have to fulfill.

ACKNOWLEDGMENT

Olympus is a R&D (Research and Development) project

TABLE II. BUSINESS MODEL COMPARISON

	Business Model			
	Mobility Provider Scenario	***Independent Partner Scenario***	***Intervening Partner Scenario***	***OSP Scenario***
Combination of Assets	Concentrated (MP[a.])	Distributed	Distributed	Distributed
Customer Ownership	Direct	Direct for both partners	Intermediated, only MP has direct customer ownership	Intermediated, only OSP has direct customer ownership
Distribution of Intelligence	Centralised at the MP, single system	Distributed, two separate systems	Distributed, tendency of centralization at OSP	Centralized (OSP)
Cost (Sharing) Model	Concentrated, all investment from the MP	Distributed	Distributed, investments mainly MP and OSP	Distributed
Revenue (Sharing) Model	Direct revenue flow to MP, no revenue sharing	Direct revenue flow to MP, sharing with IP	Direct revenue flow to the MP, sharing with IP and OSP	Indirect revenue flow to OSP, sharing with MP and IP
Suitability of integrating more partners	N/A	-	+	++
Independency of partners	++	++	+	-
Ease/Simplicity for Customer	++	+	+	+
Service Offer towards Customer	+	+	+	++

a. MP = Mobility Provider, IP = Infrastructure Provider, OSP = Open Service Platform, C = Customer

cofunded by IWT (Agentschap voor Innovatie door Wetenschap en Technologie), the government agency for innovation by science and technology founded by the Flemish Government. Companies and organizations involved in the project are NMBS/SNCB-Holding, Blue-mobility, Infrabel, Optimobil Vlaanderen, Recticel, Green City Tours, Stad Gent, Stad Hasselt, Stad Leuven, Stad Antwerpen, Vlaams Instituut voor Mobiliteit, Transport & Mobility Leuven, Universiteit Gent, Vrije Universiteit Brussel and Katholieke Universiteit Leuven.

REFERENCES

[1] European Commission, “The EU climate and energy package," Climate Action, 2012. [Online]. Available: www.ec.europa.eu/clima/policies/package/index_en.html. [Accessed: 19-Dec-2012].

[2] European Commission. Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009.

[3] J. Addison, “Top 10 electric car makers,” Clean Fleet Report, 2010. [Online]. Available: http://www.cleanfleetreport.com/top-electric-cars-2010/. [Accessed: 08-Jan-2013].

[4] R. Graham, “Comparing the benefits and impacts of hybrid electric vehicle options,” Electric Power Research Institute (EPRI), Palo Alto, CA: 2001. 1000349.

[5] F. Kley, M. Wietschel, and D. Dallinger, “Evaluation of European electric vehicle support schemes,” in Paving the Road to Sustainable Transport, 1st ed., Oxon: Routledge, 2012, pp. 75–95.

[6] S. G. Stradling, M. L. Meadows, and S. Beatty, “Helping drivers out of their cars. Integrating transport policy and social psychology for sustainable change,” in Transport Policy, vol. 7, no. 3, Jul. 2000, pp. 207–215.

[7] J. W. Grotenhuis, B. W. Wiegmans, and P. Rietveld, “The desired quality of integrated multimodal travel information in public transport: Customer needs for time and effort savings,” Transport Policy, vol. 14, no. 1, 2007, pp. 27–38.

[8] F. Kley, C. Lerch, and D. Dallinger, “New business models for electric cars - A holistic approach,” Energy Policy, vol. 39, no. 6, 2011, pp. 3392–3403.

[9] MOBIB, “MOBIB, a world of advantages,” MIVB/STIB. Your journey, 2007. [Online]. Available: www.stib.be/mobib.html?l=en. [Accessed: 11-Jan-2013].

[10] SNCB-Holding, “Olympus” Projects. [Online]. Available: http://www.b-holding.be/fr/projets/olympus. [Accessed: 09-Jan-2013].

[11] S. Shaheen and A. Cohen, “Growth in worldwide carsharing: An international comparison,” Transportation Research Record: Journal of the Transportation Research Board, vol. 1992, no. 1, Jan. 2007, pp. 81–89.

[12] P. Ballon, “Business modelling revisited: the configuration of control and value,” Info, vol. 9, no. 5, 2007, pp. 6–19.

[13] A. Osterwalder, “The business model ontology: a proposition in a design science approach,” HEC Lausanne, 2004.

[14] H. W. Chesbrough "Open Business Models: How to thrive in the new innovation landscape," Boston, Massachusetts: Harvard Business Press, 2006.

[15] E. Faber, P. Ballon, H. Bouwman, T. Haaker, O. Rietkerk, and M. Steen, “Designing business models for mobile ICT services,” in Workshop on concepts, metrics & visualization, at the 16th Bled Electronic Commerce Conference eTransformation, Slovenia, 2003, pp. 9–11.

[16] Servipark, “Servipark,” [Online]. Available: http://www.servipark.com/be/Default.aspx?culture=en-GB. [Accessed: 10-Aug-2012].

[17] Autolib’, “Autolib’," [Online]. Available: https://www.autolib.eu/economy/. [Accessed: 10-Aug-2012].

[18] Zen Car, “Zen Car: The electric solution of car-sharing in Brussels,” 2011. [Online]. Available: http://www.zencar.eu/en/about_concept.cfm. [Accessed: 10-Aug-2012].

[19] EURELECTRIC, "Market Models for the Roll-Out of Electric Vehicle Public Charging Infrastructure. A EURELECTRIC concept paper," Brussels: The Union of the Electricity Industry, 2010.

[20] O. Rodrigues, "EVUE: Electric Vehicles in Urban Europe," Lisbon: URBACT, 2012

 ISBN: 978-1-61208-282-0