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Integration of roles vs. specialization: What is the best business model for fast charging?

Felix Roeckle[1], Melchior Weinmann, Denis Horn[2], Alexander Schmidt[3]

[1]*University of Stuttgart, IAT, Nobelstr. 12, 70569 Stuttgart, felix.roeckle@iat.uni-stuttgart.de*

[2]*University of Stuttgart, IAT*

[3]*Fraunhofer Institute for Industrial Engineering IAO*

Abstract

EV fast charging is still considered a nascent market. Even though it is growing quickly, the market model and the respective business models are still under development. Especially the interplay and balance between charge point operators (CPO), e-mobility service providers (EMP/MSP) and roaming/marketplace operators may significantly change if the market grows and matures. Based on a combination of literature research and expert interviews, this work analyzes the present distribution of roles in the market and the rationale behind it. Furthermore, it provides an outlook on how the future market model could look like.

1 Introduction

1.1 Motivation & prior research

From the very beginning of their build-up, fast charging stations have been challenged with regard to their profitability [1]. More recently, first studies indicate that fast charging could be a profitable business in the short to medium term [2]. Another study has found a customer base of 900-1000 EV drivers to be the threshold for a profitable operation of a fast charging station, if no further revenue is generated by additional services, such as a restaurant, or advertising [3]. Another study from the UK has concluded that investments in fast charging infrastructure break even if the market share of EV grows by 18% per year [3].

None of the aforementioned works, however, specifically account for different types of market models: Even though the different market roles (EMP/MSP, CPO/CSO, roaming/marketplace operators) are illustrated [3, 4], it is not analyzed whether vertical integration or separation of these roles is more desirable. So far, this topic has only been discussed on a conceptual level (see Figure 1) [5, 6, 7]. Moreover, most of the related publications are driven by the sector association of the European electricity industry, Eurelectric [6, 7] and may thus be biased. Therefore, a more neutral perspective on the variety in distribution of fast charging market roles is suggested.

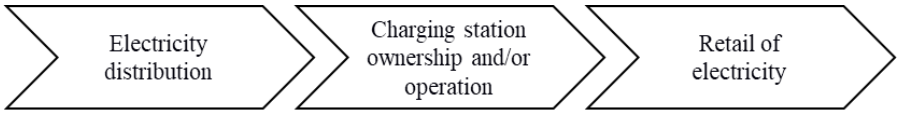

Figure 1: Conceptual framework of Eurelectric [7]

1.2 Objectives & key definitions

Building on the Fraunhofer IAO's previous research [8, 9] and the University of Stuttgart's experience as a coordinator of a German public fast charging network intended for research (*SLAM – Schnellladenetz für Achsen und Metropolen*) [10], this paper analyzes different EV fast charging business models that are present in the market today. Specifically, it answers the question whether vertical integration or vertical separation of the MSP (EMP) and CPO (CSO) roles is more desirable. A preliminary definition of the two roles is provided below (see Table 1). In the context of Eurelectric's framework, the CPO would relate to *charging station ownership/operation*, whereas the MSP would relate to *retail of electricity*.

Table 1: Preliminary definitions of CPO and MSP roles

CPO (aka CSO)	MSP (aka EMP/EMSP)
The charge point operator (CPO) deploys and operates charging stations. This includes activities such as planning, installation, support and maintenance. The CPO sells and accordingly invoices charging services to the MSP.	The mobility service provider (MSP) offers charging services to the end customer. In turn, the MSP pays the CPO for the charging services that the MSP's customers have obtained at the CPO's charging stations. The MSP manages end customer accounts and issues e-mobility tokens (e.g. RFID cards) or provides smartphone apps that customers can use to unlock charging stations.

The goal of this paper is to understand the rationale behind different business models, i.e. why a company chooses to include a certain role into their business activities or not. By expert interviews and a short literature review, it is evaluated which business models are likely to be profitable in the future, when the market structure consolidates and the customer base grows. Eventually, these insights will also point to an ideal market model, which in turn can support future policy development.

2 Methodology

2.1 Literature review as reference for expert statements

Even though no prior literature specifically speaks to the question whether vertical integration or separation of roles in the EV fast charging market is beneficiary or not, research in the field of industrial organization and economics as well as studies from analogous industries such as the railway or ICT sectors can be used as a reference. Therefore, a literature review covering these fields has been conducted.

Table 2: Overview of reviewed literature

Industrial organization and economics	▪ Biancini & Ettinger (2017): Vertical integration and downstream collusion [11] ▪ Brito et al. (2011): "Can Vertical Separation Reduce Non-Price Discrimination and Increase Welfare?" [12] ▪ Sappington (2006): "On the Merits of Vertical Divesture" [13]
Energy sector	▪ Cambini et al. (2016): „Innovation and market regulation: evidence from the European electricity industry" [14] ▪ Howell et al. (2010): „Structural separation versus vertical integration: Lessons for telecommunications from electricity reforms" [15] ▪ Mulder & Shestalova (2006): „Cost and benefits of vertical separation of the energy distribution industry: the Dutch case" [16]
ICT sector	▪ Crandall et al. (2010): „Vertical Separation of Telecommunications Networks: Evidence from Five Countries" [17] ▪ De Bijl (2005): „Structural separation and access in telecommunications markets" [18] ▪ Crew et al. (2005): „Bringing Competition to Telecommunications by Divesting the RBOCs" [19]

Railway sector	▪ Abbott & Cohen (2017): „Vertical integration, separation in the rail industry: a survey of empirical studies on efficiency“ [20] ▪ Cui & Besanko (2016): „Horizontal versus vertical separation in railway networks: Implications for network quality“ [21] Merkert et al. (2012): „The Measurement of Transcation Costs – Evidence from European Railways“ [22]

2.2 Measures of effectiveness to assess goodness of solution

The research question of this paper has been formulated above as which business model approach (vertical integration vs. separation) is *more desirable* or *beneficiary*. This phrasing requires further specification. To assess the “goodness” [23] of different solutions, measures of effectiveness (MoE) can be used. While usually, MoE represent the viewpoint of only one entity, the goals of this project consider the needs of several stakeholders. As described in the definition of the *fast-E* project,[1] these goals are [24]:

- “non-discriminatory and open-access market”
  - “in which market entrants are not hindered” (stakeholder: companies)
  - “end-customers’ charge requests are accepted at every charging location” (stakeholder: EV drivers)
- “efficiency of the entire value chain” (stakeholder: all / national economy)

Quantifying these MoE, however, has not been a priority of this research. Therefore, MoE are mainly used to guide the literature review and to develop the questionnaire for the expert interviews.

2.3 Market map as common ground for discussion

Based on first-hand insights from companies that are involved in charging infrastructure deployment and retailing of charging services, the major components of the EV fast charging “business ecosystem” [3] are captured in a so-called *market map*. This market map (simplified version shown below) is used as a basis of discussion for a set of semi-structured expert interviews with representatives from market players that display different levels of integration along the EV fast charging value chain: CPO only, MSP only, combined CPO and MSP, hardware manufacturer, IT service provider, and automotive OEM.

2.4 Expert interviews

To cover different perspectives, companies with different levels of integration along the EV fast charging value chain have been targeted for the interviews. Additionally, three neutral experts provided an unbiased opinion. This yielded the following distribution of interviewees:

Table 3: Overview of expert interviews

Role/s	# of interviews	Role/s	# of interviews
CPO only	2	Hardware manufacturer	3
MSP only	2	Neutral	3
CPO+MSP	5	Vehicle OEM	3
e-roaming provider	2	Other	1

16 of the 21 expert interviews have been conducted in person, five via phone. Due to confidentiality agreements, the names of the interviewees as well as the names of their employers are anonymized.

As the goal of the interviews was more exploratory than explanatory, only open-ended questions have been used. However, if certain topics that were expected on grounds of desk research and previous experience of the researchers, follow-up questions on specific items were raised. To ensure that certain issues were covered in all interviews, an interview guideline was used. Additionally, a market map displaying all components of the EV fast charging map has been developed to provide a common base for discussion (see below).

[1] EU TEN-T project (CEF) that this research has received funding from

The interview was divided into five sections:

Introduction: Interviewees were asked to quickly introduce themselves as well as the services their company is providing with regard to EV fast charging.

General questions: Experts were asked a few questions on electric vehicles in general and EV fast charging in particular. To avoid steering their answers too much, this was done before the market map was introduced in the next section of the interview.

Positioning on the market map: Experts were presented with the above mentioned market map and, if not covered already, asked to highlight the activities that they cover. They were also specifically asked what key value their company would bring to the market.

Current market model: Experts were asked what they think of the current market model and what they believe should be improved. Moreover, they were specifically asked what they think of the current distinction of market roles (CPO vs. MSP). They were also confronted with the statement that *charging is too expensive* and *too complicated* to see what proposals for improvement they have. Finally, experts were asked to mention further barriers for EV market uptake and explain how, in their mind, these barriers can be overcome.

Future market model: Imagining a scenario where EV mass market has become a reality, experts were asked, on the one hand, which current bottlenecks will have disappeared and, on the other hand, which new bottlenecks will have emerged. Additionally, they were asked to propose activities that are going to be more or less important (or even obsolete). Finally, it was questioned how the roles of a CPO, an MSP and roaming provider will develop in the future.

To increase validity in data collection, interviews were recorded if permitted. However, to save time, the interviews were not transcribed completely. Instead, the interview answers were structured in a spreadsheet to identify overlapping and opposing opinions. Where appropriate, succinct quotes are used to exemplify certain topics.

3 Description of current market model

3.1 The interplay of CPO, MSP and roaming providers

A generally accepted definition of three key market roles is the distinction of charge point operators (CPO, also called EVSE operators: EV service equipment operators), mobility service providers (MSP, also called EMP: e-mobility providers) and e-roaming providers. The terms CPO and MSP already have already been introduced above.

In the easiest case, a company acts as both CPO and MSP, and offers its customers charging services at their own charging stations: The entire transaction from charging to end customer billing is then handled within one entity. However, any company that acts as CPO may be interested in making their infrastructure accessible for as many MSP players as possible in order to increase utilization of their assets. In turn, any company that acts as MSP may want to enable its customers to be able to use the charging stations of as many CPO players as possible in order to maximize customer value. Finally, there are also companies in the market that act as CPO or MSP only.

Any transaction in which charging (CPO) and end customer billing (MSP) are provided by different entities, generally speaking, requires communication between the two parties for the authentication, authorization and clearing of the charging process. In this case, the CPO needs to check with the MSP whether the end customer that requests to charge at the CPO's charging station is allowed to charge, i.e. whether they have a valid contract with the MSP (authentication) or not. If the MSP reports approval, the CPO authorizes the charging session. After charging is finished, the CPO bills the charging session to the MSP, who is *clearing* the balance on behalf of its end customer. This data interchange is called e-mobility roaming.

If now every player wants to roam with as many counterparts as possible, this would require them to build a separate connection to every single counterparty. To reduce the number of connections a company needs to

build, e-roaming providers exist to channel these connections through a central hub. More details on roaming are explained in the following chapter.

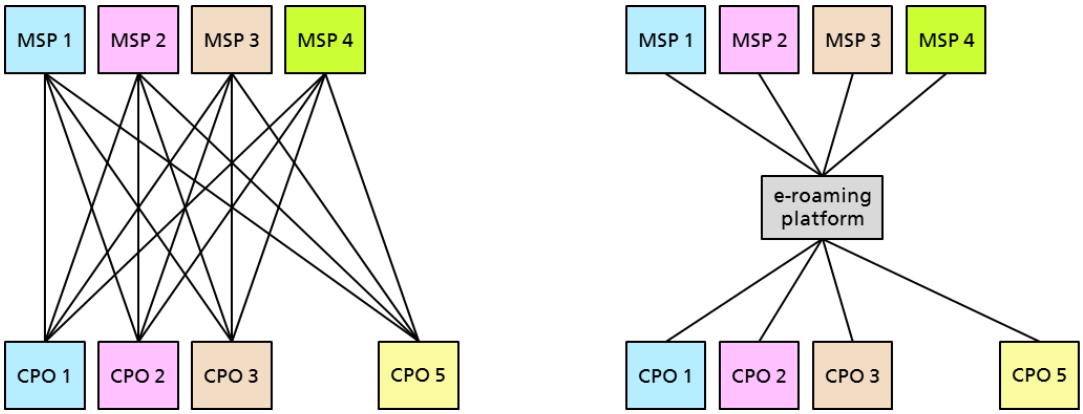

Figure 2: The function of roaming platforms

Other major roles that are relevant to the EV fast charging markets are the OEM, the (charging) hardware provider, the energy supplier and the distribution system operator (DSO). The OEM (Original Equipment Manufacturer) is responsible for designing and manufacturing (electric) vehicles. The hardware provider is understood as the entity that designs and manufactures (fast) charging stations (EVSE: electric vehicle supply equipment). The energy supplier is supplying energy, which may include energy produced by their own power plants as well as energy that is purchased at electricity markets. The DSO (*grid operator*) is responsible for the operation of the low and medium voltage distribution system (the *grid*).

The core components/services of each role and the connections between the different roles are shown in the following *market map* (simplified version):

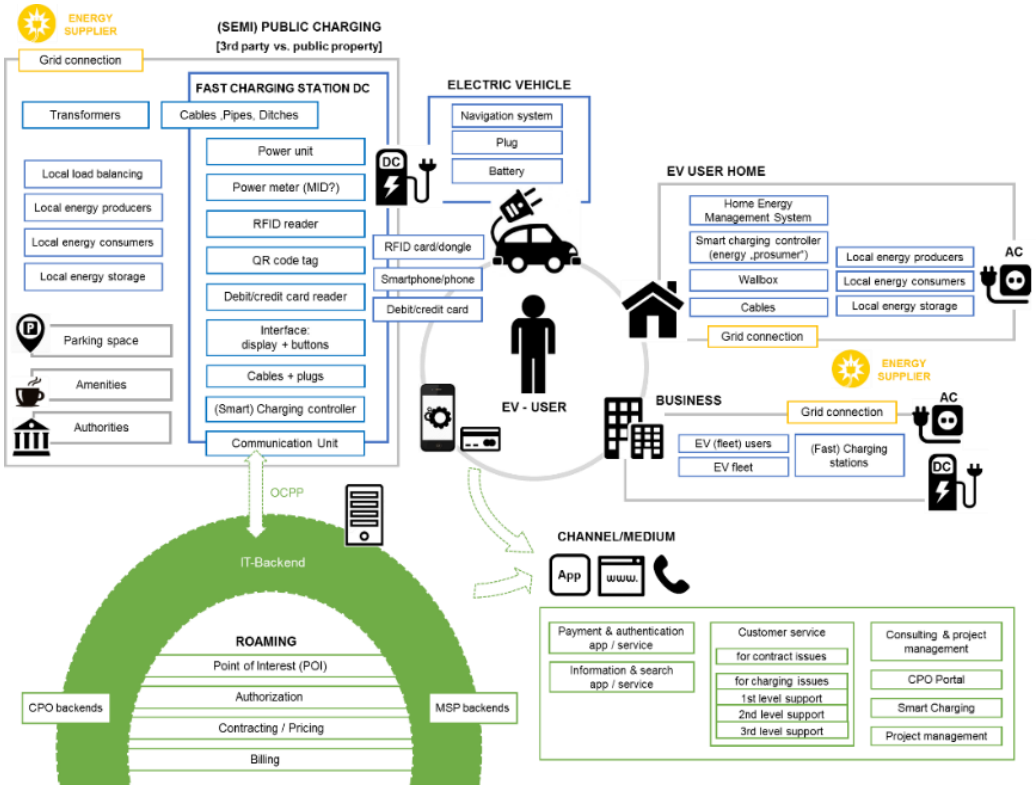

Figure 3: EV fast charging market map

3.2 Roaming & the different dimensions of interoperability

The first function of interoperability is not necessarily needed for e-roaming, but plays an important role for the findability and usability of charging stations: the transmission of POI (point of interest) data. In the most basic form, this data is static, i.e. it is created at one point in time and not updated in real-time. By definition, this static POI data can only include information that do not change over time, such as the address, or do only change infrequently, such as the opening hours of a charging station. If POI data also includes real-time information, e.g. on the current status of the charger (*available*, *occupied*, *out of service*), it is called dynamic. The exchange of POI data is needed to create an accurate overview of existing charging stations to help customers find a usable charging station as easily as possible.

In order for a customer from company A (MSP role) to unlock a charging station from company B (CPO role), the customer needs to be authorized by the MSP towards the CPO. This function is the basic prerequisite for e-mobility roaming. Authorization can either be done via whitelists or via real-time data synchronization. In the former case, the MSP periodically provides a list of authorized user IDs and the CPO matches utilized user IDs with this more or less locally available whitelist. In the latter case, every user ID that is utilized at a charging station is on demand matched with the MSP user database remotely. This advanced authorization function is sometimes referred to as *remote start/stop*.

After the charging session, charge transaction data needs to be shared by the CPO with the MSP, so that both parties are aligned on how much energy has been charged and for how much time the charging station has been used. Commonly, this information is shared by transmitting a charge detail record (CDR).

The aforementioned roaming functions (POI, authorization, and charge transaction data) merely provide the technical foundation for interoperability and data interchange, but they do not govern the commercial relationship between the roaming partners. If two companies want to be interoperable, a roaming contract or agreement between the parties needs to be in place that defines the commercial conditions of the roaming relationship. This includes the prices and tariffs for charging as well as the terms of payment. Accordingly, this roaming function can be called *contracting/pricing*.

In order for the CPO to get compensated for the charging services they provided, they need to bill these services and send an invoice to the respective MSP players, who in turn need to verify and settle this invoice. Thus, *billing* can be identified as another commercial roaming function that is required to close the interoperability circle.

3.3 Customer service (front-end): B2C and B2B interface

Customer service includes all services that help the customer understand, use and pay for (fast) charging services. A website usually serves to inform people about the charging process and offers. In addition, e-mail and/or hotline support often exist to answer questions from prospects (e.g. info on product portfolio) and existing customers (e.g. contract issues). This service for contract issues is not to be confused with the support structure that deals with charging issues, i.e. the problems that may occur when using the charging station. This service is often split in first-, second- and third-level support. Another major service component is an app or a website that provides a map of charging stations, ideally including real-time availability and pricing information. Usually, these apps can also be used to unlock a charging station (i.e. to authorize charging) and pay for the charging session. In these cases, the EV user can either have an existing contract with the provider (*contract-based payment*), or enter the payment details (e.g. credit card info, PayPal) just before charging (*direct payment*). A different method of contract-based payment is to identify oneself via an RFID card that is issued by the provider and linked to an existing contract. Another existent way of direct payment (and authorization) is to use a debit or credit card on a payment terminal right at the charging station. Depending on the type of payment, some kind of invoice is sent to the customer, sooner or later (*billing*).

4 Insights from literature review

4.1 Increased competition and efficiency resulting from vertical separation

The advantages of vertical separation that are most often explained by prior research all relate to the avoidance of (regional) monopolies, resulting in increased market efficiency due to higher competition. Vertically integrated companies that own a bottleneck resource (e.g. fast charging infrastructure) have an incentive to discriminate against other vendors [12, 17, 18, 20]. Vertical separation, however, is supposed to guarantee non-discriminatory access for all operators [12, 18] and thereby fosters competition [16]. This competition in turn leads to higher levels of efficiency [20]. Moreover, structurally separated companies are easier to monitor. Therefore, it is easier to avoid anticompetitive behavior (sabotage, collusion) than in the case of vertically integrated companies [18, 19]. Finally, econometric results from the electricity industry have shown that vertical separation fosters innovation activity [14].

4.2 Economies of scope and reduced transaction costs as benefits of vertical integration

Prior literature identifies lost economies of scope and higher transaction costs as major disadvantages of vertical separation. As the operation of infrastructure is often closely related to up- and downstream processes, unbundling these components would reduce economies of scope [16, 18, 19, 20]. Evidence from the telecommunications industry even shows that vertical separation has harmed the build-up of next-gen infrastructure networks due to the *asset specificity* of the required investments [17, 20]. Moreover, between vertically separated players, significant transaction costs may arise [15, 20], while these are minimized in the case of vertically integrated firms. Finally, vertical integration yields the benefit of harmonization between infrastructure investments, operations and maintenance [20].

4.3 Contingencies define which model is the better trade-off

Both vertical integration and separation have benefits and drawbacks. Whether the former outweigh the latter depends on several contingency factors. If (upstream) economies of scope are significant and transaction costs are high, then vertical integration is more advantageous [13]. However, if competition is threatened by discrimination, vertical separation [11, 19] or other regulatory instruments that help to avoid sabotage may be useful [13]. Another factor that affects market efficiency is the magnitude of transaction costs [22]. Only if these are low enough, vertical separation makes sense [21]. Finally, the *asset specificity* of the investments in infrastructure plays an important role: A company may only be willing to build up specialized infrastructure if it can reap the full benefits of this investment [20, 21].

5 Insights from market experts

5.1 Usability challenges of public (fast) charging: interoperability as root cause

Finding a charging station that can be used with a certain contract requires valid POI data. In reality, however, even the quality of only *static* POI data is poor. This has mainly two reasons: a pluralism of independent POI databases and the non-existence of a standard POI data structure. Additionally, some CPO players simply do not provide high quality POI data. Going one step further, the exchange of dynamic POI data requires real-time enabled roaming protocols and the connection of all players by one way or the other – which is currently not the case. Roaming protocols also play a role in enabling price transparency: only if the price info from the MSP can be transmitted to the CPO via the protocol, it can be displayed to the customer at the charging station – just like it is done at conventional fuel stations. The issue is less urgent when authentication is done via smartphone, because then the MSP can immediately display the price in their own app. Still, price transparency problems continue after charging has finished: Apparently, it often takes months until customers know how much they have been charged, which makes it difficult for them to check their bill. This delay is sometimes attributed to the low maturity level of MSP companies (“start-ups”).

5.2 Vertical integration vs. separation

The fact that roaming is so complicated certainly also plays a role for CPO players that have decided to act as an MSP as well: Only if a company integrates both roles, it can completely run through the customer experience from A to Z, which avoids price and service confusion with the EV driver. Utility companies (e.g. EnBW, Innogy and Vattenfall in Germany), moreover, already have an existing customer base that they can build on in order to maximize utilization of their infrastructure (cf. *economies of scope* above). From a CPO perspective, an integrated CPO+MSP player is independent from third parties, especially regarding the marketing of their chargers, i.e. the presentation of POI data to potential users so that these actually can be found and used. From an MSP perspective, integrated CPO+MSP players see their charging stations as bargaining chips in roaming negotiations with other CPO+MSP players. Another advantage of integrating both roles is seen with regard to the diversity of insights into the market that can be used to improve both sides of the business. Indeed, user and usage data are considered a huge asset by some companies.

Many experts in turn stress that operating complex (physical) infrastructure requires a very different skill set than providing (digital) end customer services. Thus, integrated CPO+MSP companies may lose focus, whereas specialized companies can develop specific competencies. As integrated CPO+MSP players are not dependent on roaming, this may also affect their efforts and care in properly implementing and maintaining interoperability interfaces. In addition, and contrary to the "bargaining chips"-opinion stated above, some experts think that playing on both sides and thus not being neutral can even be a disadvantage in roaming negotiations. Eventually, this could decrease the flexibility of the market and lead to the generation of "inaccessible islands" (cf. *bottleneck resource* above).

5.3 Future business models: data-driven service offerings

The (real-time) analysis of user behavior and vehicle data is seen as an opportunity for new business models. While connected data can be used to reduce operational cost by increasing efficiency, it can also be used to offer customized secondary services. One of the new offerings that is being discussed is a reservation function for charging stations. While one CPO has implemented it already, many experts think that, today, it is not needed due to a low amount of cars, and, in the future, will not be practical due to a lack of control over parking cars. Another potential source of revenue is the sale of (real-time) POI data. Additional revenue may also be created by cross-selling, regardless of whether the offerings are customized or not: A fast charging session of 15-20 minutes provides plenty of time to earn money by vending food and beverages. Just like with conventional gas stations, the margins of these additional services could help to make charging stations profitable. Speaking against data-driven business models, some experts criticize that these secondary offerings are the reason why, for instance, the authentication process is made more complicated than necessary: If only direct payment was used, the user data would be gone – or at least it would not be in the hands of the MSP. And last but not least, concerns regarding data privacy are brought forward by several experts.

5.4 CPO role in the future: surviving the charging station beauty contest

While the core competencies and key activities of a charge point operator are described fairly unambiguously by all experts, there are different views on whether the CPO role should be combined with others and how different players should interact in the future.

For today and the future, it is the CPO's main task to provide a highly reliable fast charging infrastructure at the best locations that is easy to find and accessible for everyone. Therefore, the CPO needs to scout locations, plan and manage the build-up of charging stations, do regular (pro-active) maintenance, operate an IT back-end and a 24/7 support hotline, come up with energy concepts (cue: local battery storage), and provide accurate POI data. This does not exclude that any of these activities are outsourced to even further specialized sub-contractors. For some of the experts, the scope of a CPO ends here, and "the revenue generated by the operator would be in direct relationship to the quality at strategic locations of the infrastructure deployed – not to the fact that they have a privileged relationship with one OEM" (expert statement) or MSP player. For some experts, in contrast, the "beauty contest" among CPO players is not only based on charging services but also covers value-added services offered around the actual charging process. Therefore, they think there will be more fully-integrated providers rather than specialized players. Some experts even could imagine that

OEMs fully integrate the CPO role, or that they at least very closely cooperate with CPO players to make sure there is an infrastructure in place so the cars they want to sell can be charged.

Regarding the current number of CPO players in the market, the opinions are divided: Whereas some think that there is not enough competition among the few major fast charging CPO players, others think that there are actually too many small CPO players and that it is a pain to build a working connection to all of them (mostly referring to AC infrastructure).

5.5 MSP role in the future: service, service, service & diversification

Again, experts agree on the general function of an MSP today and tomorrow: helping the EV driver charge and helping the CPO receive customers. However, it is also questioned whether this basic offer will be enough to persist in the increased competition that is anticipated for the future. Therefore, many experts emphasize that MSP players need to integrate other services than charging only. All kinds of companies are mentioned to be in a good position to offer this bundle of value-added services: charge point operators (see section above), energy utilities, telecommunication companies, banks, insurances, providers of fueling cards, internet companies such as Amazon and PayPal, retailers like Aldi or IKEA and, last but not least, the OEMs themselves. What all of them have in common is that they have an existing customer interface, into which they could more or less easily integrate an MSP offer. Especially for OEMs it is quite obvious to take up the MSP role: Firstly, there is no need to charge if there is no EV, so every customer for charging should somehow already be an OEM customer. And secondly, OEMs have prime access to car data (e.g. state-of-charge), allowing them to offer services that others could not offer (e.g. holistic routing) – at least if the provision of this data to third-parties is not required by law. Additionally, the development of OEMs becoming MSPs is promoted by car-integrated, automated authentication via *plug & charge* (ISO 15118).

Yet, experts see a justification for non-OEM MSP players. According to them, just like in the telecommunication industry, there will not be a “one fits all”-solution, but different offers targeted to the needs of different user groups, e.g. premium car drivers vs. price-conscious chargers. Still, many experts expect that pure MSP players will disappear in the future. These companies in turn argue that OEMs “have processes in place that never allow for agile IT development” and that due to their large overhead, OEMs will always be more expensive than start-up companies. Therefore, white label cooperation is discussed as an alternative solution.

The question whether the increased availability of direct payment possibilities reduces the need for MSPs and roaming platforms alike, is another controversial topic. While some experts see an undecided race, others strongly advocate one of the two solutions. On the one hand, direct payment is seen as the basic need and the easiest authentication method – provided it actually works. On the other hand, contract-based payment may be the most convenient solution in the end – provided roaming works properly. In this context, some experts also point to the banking world that is already fully interoperable today: The practice of having an EC or credit card terminal at every charger is desired by some but considered an uneconomic solution by others. Therefore, an alternative, more cost-efficient bank-based authentication method could be a welcome solution.

5.6 Roaming in the future: role or function?

As indicated above, the role of roaming platforms is challenged from all sides. Firstly, there is the fact that there are too many platforms – “there is not enough business for all of them”. Secondly, they are not needed for authentication and payment if direct payment is used, which would basically leave them with the task of collecting and distributing POI data. Still, most experts acknowledge that all roaming functions will be needed in the future and that a central hub makes sense to reduce integration and transaction cost between players. However, almost all experts agree that the roaming platform should be organized as a non-profit organization rather than being provided by a company with an “additive business model” that makes electric mobility even more expensive. Especially from the perspective of big players, peer-to-peer roaming via OCPI is considered a viable alternative to roaming platforms: By bilaterally connecting to a handful of major players, they can cover 90% of the market without being dependent on a roaming platform. However, it is also criticized that the initiative comes at a fairly late point in time and that it rather fosters isolation than openness, particularly for smaller players and new entrants. And if there will indeed be many more MSP players in the future (as stated above), a mesh approach simply is not efficient. Yet, OCPI is a widely

appreciated development, as it is a lean, modular protocol, and allows both peer-to-peer and platform connections.

Finally, there is the hypothesis that only one of the two roles is required, either MSP or roaming platform. The two pure MSP players in the sample confirm that they do basically the same things like roaming platforms and, from their point of view, an "IT and commercial middleman" is not needed. In turn, the representatives of the roaming platforms see the requirement for a central platform to allow contract-based payment for everyone. The parallel existence of several platforms is justified by different "promises of performance", and compared to the credit card industry where similar suppliers exist in parallel as well (e.g. VISA vs. Mastercard vs. American Express).

6 Conclusion

6.1 Suggested market model and business model needs

In order "to create a prosperous, competitive market where everyone can benefit" (expert statement), a non-discriminatory market model is required. This is currently not the case: Integrated CPO+MSP players may have strategic reasons for not opening their network to certain players or only opening it on discriminating terms (*sabotage*). For instance can a company that has a particularly good coverage in one region (as CPO), exploit this local monopoly and protect its MSP business by asking unreasonable B2B roaming prices from other MSP players. This distorts competition as it reduces the incentive for the CPO to compete on the infrastructure level. Therefore, the same B2B price should be applied, no matter whether the MSP role resides within the CPO-company or not.

As illustrated in Figure 4, this market model can be conceptualized as a non-discriminatory B2B marketplace: All offers from all CPO players would be open to all MSP players on the exact same conditions – the MSP players in turn can ask any B2C price from their customers. It is left to regulation experts whether this set-up can work without a required legal unbundling of CPO and MSP into two separate companies. In theory, however, it would incentivize every side to focus on their respective core business and, moreover, reduce the bargaining power of existing MSP with an established customer base, thus allowing new, innovative MSP companies to enter the market. CPOs on the other hand would merely compete to provide the best charging services at the best locations for the best prices.

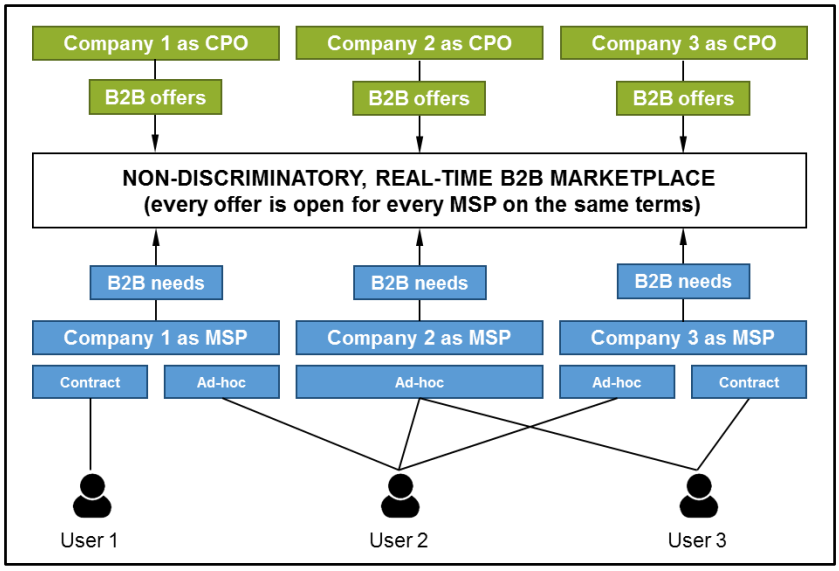

Figure 4: Suggested market model

Next to non-discrimination, the second crucial feature of the above described marketplace is that it should be functioning in real-time. Thus, prices should not be universal and static, but vary dynamically depending on the current or anticipated grid load at a certain location. For if one thing has become clear within the *fast-E*

project, it is that pricing has a significant impact on consumers' charging decisions. Therefore using price as a control mechanism for balancing grid load seems like a promising idea.

Regarding the technical implementation of this non-discriminatory, real-time B2B marketplace for charging services, several solutions are conceivable. However, the minimum requirement would be the implementation of real-time enabled roaming protocols by all market players. From an efficiency point of view, it would definitely be best to have *one* central roaming hub that aggregates all POI data and B2B offers. Yet, a multi-platform-model or peer-to-peer roaming would generally work as well.

Translating the suggested market model to the business models needed to make it work, no major change to today's situation is indicated. It is mainly an even increased specialization that will help the respective companies to survive:

- Just like one of the experts stated, CPOs will compete in a "beauty contest" for providing highly reliable fast charging infrastructure at the best locations. Moreover, to balance the grid load and maximize utilization at their stations, they will become "e-mobility brokers" adapting their prices in real-time depending on supply and demand.
- Similar to mobile virtual network operators (MVNO), MSPs of the future will compete on the basis of target-group-specific service offers. Their major levers will be added value services on the one, and attractive pricing structures on the other hand.

Depending on the realization of the real-time marketplace, some of today's roaming platforms may become redundant in the future. However, *full service* roaming aggregators will probably still be needed to connect smaller CPO players to the marketplace.

6.2 Recommendations

The market integration and business model needs outlined above relate to industry players on the one, and legislative bodies on the other hand. Therefore, action is required on both sides.

Firstly, legislators – ideally on a European level – need to make sure that the proposed market model can fully unfold itself. This may or may not require the legal unbundling of CPO and MSP roles, but in any case involves the definition of clear rules for the e-mobility market in general and EV fast charging in particular. Same pre-conditions need to be assured for all market players – incumbents and new entrants alike. To insure the efficiency of market transactions, standardized roaming protocols or at least a standardized format for POI data should be promoted. Moreover, load balancing via real-time pricing may require improved communication between charging station and grid, another area where better standards need to be defined. At the same time, however, energy market rules need to be flexibilized in order to enable CPO and MSP player to develop offers that will help manage grid load even when EV mass market adoption will lead to much bigger utilization of fast charging infrastructure.

Secondly, CPO and MSP companies need to take advantage of this proposed open market. CPOs need to build infrastructure at the right locations, make sure they work properly and provide accurate POI data so the chargers can be found. MSPs in turn need to create service offerings that are easily understandable and attractive to customers.

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Authors

Felix Roeckle holds a B.Eng. in Business Engineering from the Cooperative State University Baden-Wuerttemberg as well as an M.Sc. in Innovation Management & Entrepreneurship and Business Administration from TU Berlin and the University of Twente respectively. After two years of work experience in the industry, he joined the University of Stuttgart as research fellow in July 2016. His research is focused on the efficient design of future mobility systems, including fast charging infrastructure for electric mobility.

Melchior Weinmann holds a B.Sc. in Process and Environmental Engineering from the University of Applied Sciences of Heilbronn. In November 2016 he joined the University of Stuttgart IAT as research assistant under the lead of Felix Roeckle. Currently, he is doing his Master degree M.Sc. Environmental Protection Engineering at the University of Stuttgart.

Denis Horn holds a Diploma in Business Engineering from the University of Applied Science in Kempten as well as a M.Sc. in Innovation Management from the University of Applied Science in Esslingen. In 2010 he began working at Fraunhofer IAO and at University of Stuttgart IAT. His research aims on topics as innovation & technology management, in particular on technology commercialisation. Most of his recent work comprises projects in the area of electric mobility and charging infrastructure. As project manager of SLAM, he is in charge of fund management and investor relationship management, as well as of business model development.

Alexander Schmidt is a researcher within the Fraunhofer IAO and University of Stuttgart since 2013. He holds two undergraduate degrees in Environmental Engineering (B.Sc.) and technically oriented Business Administration (B.Sc.) from the University of Stuttgart and a postgraduate degree in Transport Engineering (M.Sc.) from Imperial College London. At present he is a project leader in public as well as direct industry commissioned research projects on fast charging for electric vehicles and other aspects of future mobility.

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