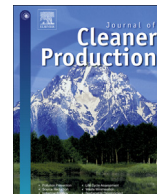




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## Product-service systems in the electric car industry: critical success factors in marketing

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### ABSTRACT

In the electric car industry the service component assumes considerable importance and it is a relevant factor in purchasing decisions. Therefore, proper management of the “Product-Service System” (PSS) is essential. This article aims to 1) identify the main sub-systems of the PSS in the electric car industry and 2) identify the critical success factors (CSFs) in marketing. The review of the literature led to the definition of four sub-systems: vehicle, infrastructure, on-board electronics, and energy. Based on these PSS sub-systems, organisations belonging to each sub-system were selected, and five managers were interviewed. The data were analysed using a cognitive mapping technique.

Ten CSFs were identified, of which two belong to the vehicle sub-system (value proposition and product-service system bundle); one relates to the electronic on-board sub-system (advanced navigation systems); three relate to infrastructure sub-system (incentives, alternative transport systems and advocacy campaigns) and three belong to infrastructure and energy sub-systems (ease of use, proximity of charging point and standardisation). Finally, partnerships among players involve all the four sub-systems. Moreover, the relevance/manageability matrix offers evidence that partnerships represent a priority factor that requires immediate action from companies. The research offers a new means to identify CSFs by using a PSS analysis rather than taking an industry sector perspective.

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### 1. Introduction

The marketing of electric vehicles is not a recent development. By the end of the nineteenth century, they were already available on the market. In the early twentieth century, Thomas Edison and Henry Ford, who were friends, worked together on plans to build and market an electric car.<sup>1</sup> After World War I, however, electric vehicles were gradually abandoned in favour of those powered by the internal combustion engine (Beaume and Midler, 2009; Frery, 2000). Only in the 1970s, thanks to growing concern about environmental issues, did public institutions and private companies

begin to look again at the potential of electric vehicles. Despite the crisis of 1973, however, the oil market remained too strong for the idea to take off. With the beginning of the new millennium, the issue was addressed more seriously and the dilemma of whether it was time to launch an electric car onto the market had to be faced.

From a consumer perspective, the electric car is substantially different from the traditional car. Although it meets a similar need, the electric car has a number of innovative features. The service component is particularly important, and the literature suggests that this component is a relevant factor in decisions to purchase electric cars (Rogers, 1962 and 2003; Godlevskaja et al., 2011). Therefore, proper management of the “Product-Service System” (PSS) is essential.

The need to follow an approach based on PSS management is clear, especially in new or evolving markets such as the electric car industry, and this means that companies must develop new product-service systems for the market. Despite the growing importance of the PSS approach, the academic literature has remained sparse, especially in the field of electric vehicles. This research therefore aims to achieve the following objectives: to identify the main sub-systems of the PSS in the electric car industry

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<sup>1</sup> Henry Ford said in an interview: “Within a year, I hope, we shall begin the manufacture of an electric automobile ... The fact is that Mr. Edison and I have been working for some years on an electric automobile which would be cheap and practicable. Cars have been built for experimental purposes, and we are satisfied now that the way is clear to success. ... Mr. Edison has been experimenting with such a battery for some time.” *The New York Times*, January 1914.

(RQ1) and to identify the critical success factors in marketing that may increase the diffusion of electric cars (RQ2).

To that end, the research begins with a broad survey of the existing academic and managerial literature to define a theoretical framework that describes the main characteristics of the PSS of the electric car industry. To address the second question, a trial qualitative analysis is developed to examine the organisations belonging to four sub-systems. The main research results are subsequently explained. In the final section, conclusions are drawn, including several important implications for management, as well as the limitations of this study, and future directions.

## 2. The role of services in the electric car industry

Although electric cars meet the same needs as traditional cars from a marketing perspective, they should be considered a new market rather than the evolution of a mature product. This novelty is perceived by consumers due to the many innovative and unique features of electric cars. Consumers of these types of products are willing to accept the challenge of novelty, and they share the particular quality of “venturesomeness” (i.e. accepting hazard or risk). Their perception of novelty predisposes them to see electric cars as an opportunity for psychological gratification, which, in turn, leads them to make a primarily emotional and status-seeking purchase (Rogers, 1962 and 2003).

Much of the research on consumers of electric cars was conducted to achieve a better understanding of the purchasing process. According to BCG research (2011), for most consumers, environmental concerns and the opportunity to save costs are the primary reasons for considering an alternative to the internal combustion engine. Moreover, that study showed that there is a strongly motivated sector of “green” consumers who are willing to pay more for a green car, even if the total cost of ownership compares unfavourably with conventional vehicles. This sector represents approximately 6% of the car buyers in Europe. A higher percentage of consumers (44%) could be convinced to pay more up front if they were able to recoup the initial investment back over time.

Research conducted in Germany and France by Berger, (2010; 2011a,b) found that the accessibility of charging stations is still seen by consumers as their main priority, followed (with equally significant importance) by the availability of specific navigation systems. The research indicates that the functional attributes of the electric car (engine performance) are less important, and additional benefits that enhance its overall effectiveness are required. It is in this context that the service component emerges as a relevant factor in purchasing behaviour (Godlevskaja et al. 2011).

These findings are confirmed from a management perspective. Research by KPMG (2011) on a sample of 200 managers from the automobile industry suggested that future consumers will continue to place high importance on the cost reduction from fuel (fuel efficiency). In addition, the value of “security” and “styling” is confirmed, and features such as “built-in navigation technologies” and “telematic personal assistant” have increased in importance the most when compared with data from 2009 to 2010. In this context, price becomes less important. Indeed, setting a higher than average price may represent an opportunity for cultural elitism.

These findings highlight the central role of the intangible component (which is typical of services) in creating an innovative automotive style in which functional and tangible benefits are integrated with symbolic and cultural status meanings. Based on these considerations, many scholars argue that a significant increase in the number of electric cars will occur solely through the evolution “from [a] product to [a] PSS approach” (Cherubini and Iasevoli, 2012).

## 3. The sub-systems of the electric car PSS

To increase competitiveness, companies from various industries have begun to enrich their products by adding services (known as the product augmentation approach, Levitt, 1980). Currently, the addition of value in many industries occurs through “co-creation” (Normann and Ramirez, 1998) by a constellation of actors, such as suppliers, business partners, customers, community and even competitors.

The “Product-Service System” (PSS) field of study has recently emerged, based on studies on the value constellation and considering theoretical models that focus on service-dominant logic (Vargo and Lusch, 2004, 2008). PSS can be defined as “a system of products, services, supporting networks, and infrastructures that is designed to be competitive, to satisfy customer needs, and to have a lower environmental impact than traditional business models” (Mont, 2002, p. 239). The literature on PSS in recent years has analysed a variety of issues, treating PSS as a new business model: types and key elements (Goedkoop et al., 1999; Tukker, 2004); methods for development (Manzini et al., 2004); and benefits, risks and barriers (Kuo et al., 2010). Nevertheless, the underlying issue which emerges from all these studies is sustainability.

This link between PSS and sustainability has been widely explored and has led to many studies focusing on particular categories of sustainable products (Manzini and Vezzoli, 2003). Although it has been demonstrated that PSS is not the equivalent of sustainability (Tukker and Tischner, 2006) and the development of PSS does not create sustainability (Pigosso et al., 2010) it appears that the two concepts are closely related because “the PSS concept tries to solve sustainability problems (almost) entirely by changes in a business–client interaction along a value chain, in an existing market context” (Tukker and Tischner, 2006, p. 1554). Therefore, the PSS proposition changes the relationship between companies and their customers, and it incentivises a shift in business thinking from selling products to providing service solutions to customers (Pigosso et al., 2010). As a result many companies have started to change their business model to PSS, through the improvement of product design and increasing the supply of services. This can provide environmental benefits – such as reduced consumption, dematerialisation, more efficient products with longer lifecycles, reuse, reduced waste and recycling (Manzini and Vezzoli, 2003; Mont, 2002) – promoting sustainable development (Mont, 2002).

Consistent with the trends of the triple bottom line and corporate sustainability, Sempels and Hoffmann recently argued that “sustainable service systems (3S) may be defined as the conjunction of an innovation strategy developed by an organization interacting with other organizations and the institutional environment” (Sempels and Hoffmann, 2011, p. 4) and the approach can be used to achieve the following goals:

- to move the focus of business from the design and sale of products to the provision of integrated solutions that can meet the particular needs of the customer;
- to promote more sustainable consumption patterns and new relationships aimed at reducing the negative social and environmental impacts of manufacturing.

Although PSS is commonly defined as a business model, it permits a generic approach which can then be applied to investigate the wider economic and environmental aspects of business. For example, Goedkoop et al. (1999) assess the economic and environmental relevance of Product-Service Systems and their suitability and value in the context of national environmental policy.

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