

*EVS25**Shenzhen, China, Nov 5-9, 2010*

Creating new value-added configurations in the electric vehicle industry

Peter Wells

Cardiff Business School, Aberconway Building, Cardiff CF10 3EU, UK, wellspe@cardiff.ac.uk

Abstract

As the electric vehicle industry prepares to make the transition from niche to volume applications, so it is apparent that the traditional automotive industry value chain is insufficient to the task. The successful production, sale and use of electric vehicles on a large scale demands that the industry look beyond traditional boundaries to create new value added configurations. In this perspective, electric vehicles are not simply another technology that can be folded into the existing way of doing business for the automotive industry. On the contrary, this paper seeks to show that the mass adoption of electric vehicles will bring new ways of creating and capturing added value. The growth of the electric vehicle sector is unlikely to be entirely monopolized by the existing major vehicle manufacturers, although it is entirely reasonable to expect that their overall preeminence will be preserved as the entities with the technological capability, brand reputation and marketing knowledge and structures to build and supply electric vehicles to customers. It is concluded that about designing product and mobility offerings to achieve market acceptance in the face of levels of fragmentation and turbulence unprecedented in the industry. Risk aversion may not constitute a viable strategy in these circumstances, but neither are there simple solutions to be applied.

Keywords: Business models, added value configurations, electric vehicles, automotive industry

1 Forces for transition: factors driving new added value configurations

Every industrial activity can be understood as an economic structure through which materials are transformed into products, which in turn are distributed and sold to consumers. Over a period of time, distinct industries tend to establish distinct institutional arrangements both within the boundaries of the firm and beyond whereby value is added or created, and then captured. These institutional arrangements are added value configurations, which may also be seen as business models. As a result of institutional isomorphism, shared technological foundations, and embedded socio-cultural expectations of the product and or service provided these business models tend to gravitate towards a broadly similar set of characteristics within an industry. As a consequence, there emerges a shared sense of ‘this is how we do business in this industry’, a set of expectations and norms, attitudes and beliefs, that along with the concrete reality that accompanies a particular industrial activity results in characteristic business models. While it is certainly the case that there are important and enduring differences between the

business models of firms engaged within a single activity like the automotive industry [1], it is also the case that at a more fundamental level the business models tend towards similarity in structure, with the differences evident more at an operational level.

Previous research has identified the fundamental characteristics of the automotive industry business model as it applies to contemporary mass production. This model has emerged, albeit unevenly, over time as other competing models have been marginalized or vanquished. The predominant automotive industry business model has its foundations in the emergent mass production industry of North America in the early 1920s, and is defined by three main innovations: the moving assembly line along with standardized production (Ford); the all-steel body (Budd); and the M division multi-brand structure along with credit finance for consumers (Sloan) [2]. Ultimately, these innovations resulted in an industry business model centered on manufacturing economies of scale, centralized factories, long outbound logistics lines, independent franchised dealerships to sell the product, and revenues mostly generated by the sale of new product. The model was particularly suited to driving down the cost of production and thereby expanding the available market by reducing the price faced by consumers. In the early years of this mass

industry the need for differentiation was lower because consumer priorities were simply based on accessing motorized mobility, and hence large numbers of essentially highly similar vehicles (notably in the form of the VW Beetle) were acceptable.

Business models are not immutable however. First, business models can evolve over time as has happened with aspects of the automotive industry business model. A significant change from the 1920s is that of vertical disintegration, whereby a much higher proportion of value added is outsourced by vehicle manufacturers now than was previously the case. The emulation of the Toyota Production System and the practices of 'lean production' [3] may be understood as refinements and elaborations of the fundamental business model. In some respects, these evolutionary developments may have arisen out of necessity, in order to retain the underlying fundamental business model. The soaring capital cost of vehicle design, tooling and factories meant that resources had to be concentrated on these core areas given the primacy of the business model focus on manufacturing economies of scale. Increased outsourcing and initiatives to reduce working capital were mechanisms to increase the efficiency of capital investment for vehicle manufacturers.

Second, however, business models can change more radically as a result of new organizational and/or technological innovations which better align the value creation configuration to the needs of the market. Importantly, changes in the market can render a previously successful and enduring business model redundant. That is, a business model can 'fail' not necessarily because of some inherent flaw or weakness, but because the world has changed around it. Indeed, this question of the 'fit' of a business model to its market in the broadest sense is one of the reasons why universal business solutions are in practice rather difficult to apply across diverse social and cultural settings around the world.

Interest in business model reinvention became more prominent with two developments: the dot.com boom and the interest in exploiting the market potential of the so-called 'bottom of the pyramid' [4, 5]. In both cases, it was argued that re-engineering the business model could create new value adding configurations with distinct competitive advantages over more traditional ways of doing business in the sectors concerned. In most cases, innovative business models tend to combine new organizational forms with aspects of new technology (either in terms of the product or service supplied, or as an enabling factor), and with new value propositions to customers. There is a roll-call of famous innovative

business models that have challenged established business practice including Amazon and Dell ('clicks not bricks' retailing), Southwest Airlines and Ryanair (low-cost air travel), Xerox (product-service systems) and Bodyshop (ethical cosmetic products). For this paper, then, the first question is whether there is a reasonable basis to anticipate a change in the dominant automotive industry business model, and then to establish the introduction of electric vehicles brings with it sufficient change in technology and market to support radical business model innovation. These considerations are important when analyzing the scope for business model innovation. The following observations suggest that there are strong grounds for seeing the introduction of electric vehicles as at least bringing the opportunity for new business models, if not mandating the necessity for such new models:

Existing vehicle manufacturers and their traditional suppliers require new competences and skills, knowledge and experience. As a result, traditional norms and practices are not necessarily a guide to best practice with respect to electric vehicles;

The pace of technology change is very high, leading to turbulence and uncertainty over technology choices. The prevailing business model is grounded in technologies that have evolved slowly over more

than 100 years, including characteristically long product cycles and new product development times;

New supply chain relationships will be required, often with companies with limited automotive industry experience. It is likely, for example, that new materials and technologies will throw up new post-vehicle life challenges in terms of recycling or re-use;

Many new players are emerging along the value creation chain. Again this de-stabilizes the existing structures;

Electric vehicles cannot be deployed without parallel developments in infrastructure, taxation and incentive regimes, type approval processes, insurance policies, and much more. The orchestrated nature of this process challenges traditional vehicle manufacturer dominance of production and distribution of finished vehicles;

Consumers both retail and corporate are faced with new technological and financial risks with uncertain outcomes. In turn, this raises the importance of new value propositions to customers, some of which can best be realized by innovative business models;

Economic circumstances in many countries remain highly challenging. In the mature markets, saturation (and over-supply) and multiple constraints on car

use are reducing the utility of outright car ownership, with much greater interest in ‘usership’ modes of operation. In emergent markets, chronic lags in infrastructure development are undermining growth potential;

Payback times are long; typically longer than the usual lease or contract purchase period for buyers of new vehicles. Electric vehicles are likely to show greater longevity than traditional vehicles, ultimately reducing the scope for new vehicle sales.

In addition, and quite distinct from the above discussion on electric vehicles, it is worth noting that for many vehicle manufacturers the existing business model is in any case verging on collapse and failure. Across the industry the recession that started in the United States in 2008 and then spread to many other markets exposed many vehicle manufacturers to economic pressures that they were unable to contain. Many reported deep losses, and resorted to plant closures and other cost-reduction strategies until the entire industry was effectively rescued by multiple government initiatives such as giving consumers incentives to scrap older vehicles and purchase new ones [6]. While it is usual to ‘blame’ the recession for these problems, it is equally plausible that the recession simply highlighted what were in any case long-term,

underlying, structural failings in the existing business model for which the traditional strategic solutions were of declining efficacy. External industry observers and analysts have long identified these chronic structural failings [7, 8], but there has been rather less agreement as to how such failings might be overcome.

2. Innovative added value configurations and the extended automotive industry

As a consequence of the above forces, the conditions are right for an extended automotive industry with multiple stakeholders to be brought into new and constantly re-shaping added value configurations, including circular value creation systems. The traditional Porter linear value chain is of decreasing relevance to this industry, as are the traditional business models. Apart from the supply, production and retail aspects of the industry, the new added value configurations include academia, utilities, government at many levels and through many agencies, market analysts and consultants, and new intermediaries typified by, but not restricted to, Better Place. Cumulatively and collectively, the extended automotive industry is changing not just the technology of the car, but also how cars are

bought and used. The value proposition to customers requires more than just the provision of suitably branded vehicles and franchised dealers to service them. Rather, the value proposition can (and possibly must) involve ways of new ways of financing, recharging capabilities including smart grid networks, and new information provision via real time data. New added value configuration offerings more akin to mobile telephones, internet businesses, or budget airlines are emerging around electric vehicles which are potentially sold as packaged product-service systems and ‘usership’ models. At the same time, some vehicle manufacturers are seeking control over the entire battery life cycle in order to ameliorate high battery costs for consumers. Electric vehicles may be expected to bring about some fundamental changes in cultures of automobility in an era of eco-austerity [6].

As a consequence, the automotive industry may well come to exhibit different and competing business models, possibly in parallel with the existing traditional business model. Equally, however, it may be the case that new entrants come between the vehicle manufacturers and their customer base, such that in effect a new business model is imposed on the industry even where the industry does not particularly want that model or benefit from it.

These two scenarios are examined in turn.

2.1 New business models within the automotive industry

The growth of the electric vehicle sector is unlikely to be entirely monopolized by the existing major vehicle manufacturers, although it is entirely reasonable to expect that their overall preeminence will be preserved as the entities with the technological capability, brand reputation and marketing knowledge and structures to build and supply electric vehicles to customers. New business models within the automotive industry may come from either new entrants (including firms that are currently suppliers to the vehicle manufacturers), or from within the existing vehicle manufacturers.

In the latter case the result is likely to be a hybrid enterprise that has a new business model for electric vehicles alongside elements of the traditional business model for traditional vehicles. That is, the major established vehicle manufacturers may develop new business models for their nascent electric vehicle markets, and these may impinge to a greater or lesser degree on the traditional approach. An example of this is the Peugeot Mu concept, deployed in some selected locations in Europe over

2010, whereby electro-mobility packages are offered to customers. In brief, customers may purchase or lease an electric car from Peugeot and, at a selected few dealerships, have access to other electric vehicles in the Peugeot range or indeed a low-carbon internal combustion engine vehicle for occasional long-range applications. This offering can be understood as a transition step from selling cars to selling mobility, while addressing some of the functional limitations for customers of owning an electric vehicle. A second example is the Nissan – Sumitomo 4R concept, which seeks to find ‘second life’ uses for car batteries that have fallen below expected service standards when installed in a vehicle but which still have useful capacity and re-charge capability in less demanding applications such as emergency back-up supply. This concept can be understood as finding a mechanism to reduce the

battery cost and depreciation risk to which a customer may be exposed when purchasing an electric vehicle, but also take the vehicle manufacturer much further into life-cycle management of the product.

New entrant vehicle manufacturers, which in any case tend to be small compared with the existing high-volume vehicle manufacturers, are almost compelled to develop innovative business models in order to compete at all, whether or not they are concerned with the production of electric vehicles. In principle, it is possible to identify which aspects of the business model may change for new entrants, although it is not necessarily the case that all such aspects will be adopted simultaneously. These are summarized in Table 1.

Table 1: Main potential aspects of business model innovation around electric vehicle manufacturing

Item	Change	Potential Benefits
Material leasing.	Do not purchase materials but lease them.	Much reduced purchasing costs; encouragement of a whole lifecycle economic model from suppliers; product stewardship.
Open source design.	Do not insist on intellectual property rights; suppliers may give their designs for components into the main design.	Faster to market; possible for customers to participate in design process; continuous product development more possible.
Design for re-manufacture.	Vehicles designed with the intention that they will be returned for refresh or remanufacture.	Vehicles become 'technical nutrients' or assets in the market; lower total manufacturing cost over several generations; reduced material consumption; reinforces customer lock-in.
Low volume manufacturing.	Plant and tooling designed for circa 5,000 units per annum.	Many lightweight technologies viable at low volumes; investment can be scaled according to demand with lower risk start-up costs; production

		can be close to the market.
Low volume models	Vehicles designed for low breakeven volumes circa 5,000 units per annum.	Low risk new model programme to support experimental designs; easy to introduce or withdraw models; faster model development process.
Customer-focused factories.	Low volume plants established only to serve single important (corporate) customers at the point of demand.	Much greater levels of customer service; minimal logistic lines for finished product.
Factory-retail outlets.	Dispense with franchised dealerships; factory also does sales, maintenance, repair, re-fit, and end-of-life vehicle treatment.	Erase cost of dealerships and distribution; capture higher share of revenues created by use of vehicles; more robust business not just dependent upon new vehicle sales.
Area mobility schemes.	Supply and manage the vehicle fleet for spatially defined electric mobility schemes.	Shift revenue streams to income from per-mile use of vehicles; control over maintenance, etc. and information on user behavior; not direct competition with established vehicle sales.

Elements of the characteristics identified in Table 1 are evident in several new entrants associated with the electric vehicle or fuel cell sector [6] including Riversimple, TH!NK, Smiths Electric Vehicles, and Gordon

Murray Design.

2.2 New business models external to the automotive industry

Alternatively, the electric mobility market space may ultimately be controlled by companies or organizations other than the vehicle manufacturers, who in effect would be subsumed by another business model not of their creation. There is an element of this demotion of the vehicle manufacturers implied in the Better Place business model, and it will be intriguing to see who exactly 'owns the customer' as the initiatives in Denmark, Israel and elsewhere become established. It is quite possible that the vehicle manufacturers become rather like mobile telephone manufacturers in relation to mobile telecoms service providers: little more than equipment suppliers with declining brand leverage with products that become increasingly like low-margin commodities. The real revenues in mobile telecoms are not in equipment provision, but in value added services, and this may be the case for electric vehicles in the future. In many respects relegation to the status of mere equipment supplier is the nightmare scenario for established vehicle

manufacturers. Product differentiation and brand identity may be ever-more difficult to sustain under these circumstances, while cost reduction pressures will become intense.

Somewhat less likely, but still plausible, is that other parties will seek to capture a share of the emergent electric vehicle mobility space, again with very different business concepts to those employed in the automotive industry. Such 'left field' entrants could include companies with a strong brand in unrelated areas that are seeking new leverage opportunities allied with new customer propositions (Virgin would be a candidate for example), or perhaps electricity suppliers who with smart grids envisage the electric vehicle as more of a mobile energy storage device that they could manage on behalf of customers. Brands with strong ethical or environmental credentials might wish to create sustainable low-carbon propositions for consumers premised on renewable energy generation of electricity for vehicles. City and transport authorities might wish to extend from the provision of the usual buses, trams and underground rail systems and into publicly owned fleets of vehicles where the branding and

identity is primarily the city authority, not the manufacturer – think of the Parisian electric bicycle scheme for example. In all of these scenarios the electric vehicle is less of a branded object of desire to be bought and owned by individuals, and more of a public asset or tool where the primary focus is on the service provided. Electric vehicles that come ‘back to base’ to be recharged and maintained are well suited to this sort of application.

3. Conclusions for industry and government policy

For the existing automotive industry seeking to make a transition to electric vehicles, and for the emergent new entrants of which there are many, the deployment of electric vehicles is no longer just about technology. It is, rather, about designing product and mobility offerings to achieve market acceptance in the face of levels of fragmentation and turbulence unprecedented in the industry. Risk aversion may not constitute a viable strategy in these circumstances, but neither are there simple solutions to be applied. Established vehicle manufacturers have the added complication of deciding how far they can integrate electric vehicles into their existing business model, how far to compromise that model,

and to what extent it is possible to maintain two parallel business models without causing undue market confusion. New entrants, including for example Chinese brands seeking to enter the established markets, may have an unprecedented and once-in-a-lifetime opportunity to establish themselves around the emergent electric vehicle segments when for more traditional vehicles the brand landscape is rather more firmly entrenched. Suppliers too are likely to be affected by these changes. At the very least suppliers will need to be able to adapt to the requirements of new business models, but in some cases the level of adaptation is extreme. An example is that of material leasing, where a supplier no longer sells a product to a customer, but leases it on a long-term basis on the understanding that at some point in the future the material will be returned for re-use or a second use. As a destabilizing factor in the global automotive industry, electric vehicles and the new business models they may engender will further add to the turbulence in the sector and probably accelerate the rate of structural change: put simply, some traditional vehicle manufacturers will not be able survive.

For government at international, national and local

levels the same theme of risk also applies. The environmental and resource-strategic imperatives that underpin the support for electric vehicles will be challenged by the weakness of not all locations will succeed in gaining a part of the nascent electric vehicle industry, and nurturing of electric vehicle mobility may not be enough. Those public authorities that venture into the electric mobility provision market may also find that the call for new ways of working, with new partners, and new propositions around mobility for citizens all raise major new challenges in both conceiving and executing the transition to electric vehicle mobility.

References

- [1] J. Mikler, '*Greening the car industry: Varieties of capitalism and climate change*', Cheltenham: Edward Elgar, 2009.
- [2] P. Nieuwenhuis and P. Wells, 'The all-steel body as the cornerstone to the foundations of the mass production car industry', *Industrial and Corporate Change*, 16 (2), 183-211, 2007.
- [3] J. Womak, J. Roos, and D. Jones, *The machine that changed the world*, New York: Rawson Associates, 1990.
- [4] C. K. Prahalad, *The fortune at the bottom of the*

pyramid: eradicating poverty through profits, Boston: Wharton School Publishing, 2005.

- [5] A. Y. Osterwalder, Y. Pigneur and C. L. Tucci, 'Clarifying business models: origins, present, and future of the concept', *Communications of the Association for Information Systems*, 15, 1-40, 2005.
- [6] P. E. Wells, *The automotive industry in an era of eco-austerity*, Cheltenham, UK and Northampton, MA USA: Edward Elgar, 2010.
- [7] J. Maxton and J. Wormold, *Time for a model change*, Cambridge: Cambridge University Press, 2005.
- [8] M. Holweg and F. Pil, *The second century*, Boston: MIT Press, 2004.

Dr Peter Wells is co-Director at the Centre for Automotive Industry Research in Cardiff Business



School, where he also lectures on international sustainable business, business models, and innovation. He has published numerous books and papers on the global automotive industry.