

Competence management

- Challenges for international automotive companies



Selected research results from the Chair of
General Business Administration & International Automotive Management and
the Center for Automotive Management (CAMA) 2011

Executive Summary

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Executive Summary

In 2010, research at the Chair of General Business Administration & International Automotive Management at the University of Duisburg-Essen came under the heading “The transition to electric mobility – challenges for international automotive companies”, in 2011 our work focused on “competence management” in the automotive industry.

According to a forecast produced by our Center for Automotive Management (CAMA) for the German automotive market, 2012 sales in Germany would be only in the region of 3.10 million units in the realistic case. That is a slight increase compared to around 2.9 million units in the year 2010, but a decline compared to 3.16 million units in 2011. In 2010 we still assumed that around 3.2 million vehicles could be sold in Germany in 2012. We had to adjust this forecast because of the debt problems in the EU, declining German exports and the resulting only slight growth in GDP (expected growth for 2012: 0.7 percent). Since sales of automobiles will deteriorate still further in Germany – particularly because of the downturn in population growth – German automotive companies have to concentrate more and more on their competences, because competences drive future profits. Particularly because the domestic market is no longer growing, German automotive companies - irrespective of growth opportunities in other countries, particularly in Asia – have to improve their competences.

Since all competences lose value over time, automotive companies must

- on the one hand, further develop competences in the traditional internal combustion engine technology and
- on the other, build new competences in electric mobility and for the new growth markets.

Competences can only be further developed in the traditional internal combustion engine technology if companies succeed in changing the ratio of the production to the knowledge boundary by limiting the outsourcing of competence-related value adding activities and securing the price premium as the price in excess of that paid for basic performance in the market.

New competences in electric mobility are needed because according to the CAMA forecast electric mobility in Germany will reach the critical market share of 5% as early as 2018 and a new technology will therefore make its breakthrough. In the year 2020, the number of electric vehicles on German roads (1.7 million) will be higher than the target set by the Federal government (1 million vehicles). However, our market analyses of pure battery electric vehicles in Cologne, four cities in the Ruhr and in the district of Wesel reveal that acceptance of these vehicles is still low, partly because of the inadequate charging infrastructure. Since there is still a significant discrepancy between the offering of electric vehicles and customer requirements, new competences have to be built up in this area. In addition, the transition to electric mobility will take place in the context of a fundamental transformation of mobility with new mobility trends, so that all-round vehicle-related competences are not now the only requirement, but broader competences in mobility. These competences have to be built up in the transition to electric mobility in parallel with the further development of competences in traditional internal combustion engine technology. This requires the competences of ambidextrous management.

The automotive companies are also currently increasing their value added in the new growth markets, particularly of the BRIC countries, despite the risk of losing know-how, particularly in China. High foreign investments are required to secure a company's global market position and cover the large markets, particularly the Chinese market. These investments are no longer into production only,

but also into other value adding activities such as research and development. The management of the globally operating automotive manufacturers and suppliers therefore has to be adapted to the changing importance of the large foreign subsidiaries and the autonomy of these subsidiaries has to be strengthened, e.g. by creating regional centers of competence.

Some of the research results were developed in the "Pricing" sub-project of the ColognE-mobil project and the "New business models in the transition to electric mobility" project in the context of the North Rhine-Westphalian regional competition ElektroMobil NRW, and discussed in 2011 at a number of conferences: these included the Symposium of the International Network of the Automobile (Gerpisa) in Paris, the 3rd Wissenschaftsforum Mobilität in Duisburg (organized by Prof. Dr. Heike Proff) and the conference on Strategic Competence-Based Management (CSM) in Linz. New competences in the automotive industry are also taught in the new Master's course "Automotive Engineering & Management" at the University of Duisburg-Essen (coordinated by Prof. Dr. Heike Proff).

I. Securing competences of German automotive companies in the traditional internal combustion engine technology

All competences lose value over time. German automotive companies' competences in the traditional internal combustion engine technology are being lost to a particular extent at present because these companies are surrendering competences by outsourcing. As a result, they are no longer able to base their knowledge across their products' total value adding process on experience from their own value generation. This development is useful and necessary in labor-intensive sectors such as the footwear and clothing industries (footwear and clothing manufacturers produce (almost) nothing themselves nowadays). In technology-intensive sectors such as the automotive industry, where the price premium as the price above the price for the basic performance in the market is also technology-driven, the drain of knowledge and competences threatens competitiveness and therefore profits in the long term.

Our studies show that the ratio of the knowledge to the production boundary is changing and the automotive companies' price premium is falling. Competences in the traditional internal combustion engine technology can only be protected if companies succeed in limiting the change in the ratio of the production to the knowledge boundary caused by the outsourcing of competence-related value adding activities and in safeguarding the price premium.

1. Limitation of the changes in the production and knowledge boundaries

The automotive companies lose competences in particular when they modularize too much in the context of their optimization programs and outsource activities. The question arises here of whether companies can maintain knowledge permanently that is not solely based on experience with their own production and thereby secure above-average returns in a fiercely competitive environment.

Looking at manufacturers of technical instruments and components such as PCs or drive controls, and very particularly clothing and footwear manufacturers, it is assumed that knowledge can exceed a company's own vertical integration. This is explained by the fact that it is possible to transfer some or most production to suppliers for cost reasons without losing competence, so long as a company

participates in adding value at least through development and marketing, more so through the management of core suppliers and in particular through the additional in-house manufacture of individual parts and system integration. This gives the original equipment manufacturers a total product competence which their suppliers do not possess.

Looking at companies in traditional process industries such as the chemical industry or specialty industries such as aircraft construction, but also in the automotive industry, on the other hand, it is assumed in accordance with the knowledge- and competence-based theory of the firm that a company's knowledge and production boundary must coincide to a large extent. Knowledge is seen as a critical production input factor and the active linking and further development of knowledge is viewed as a core competitive advantage, which is why production outsourcing is invariably also associated with a loss of competence and vertical integration should be the aim.

In a study of 208 manufacturing companies, we discovered in 2011 that the ratio of the production to the knowledge boundary cannot be explained by industry membership. The decision as to whether a company has to acquire knowledge through its own production or can also achieve total product competence by coordinating suppliers in a network and can therefore subcontract value adding activities to suppliers depends first of all on the products (standardizability and efficiency of the supply markets) and the production and R&D processes. However, this decision cannot be made purely product-specifically, but is closely associated with the ability to command a price premium and therefore influenced by the decision in favor of a differentiation or product innovation strategy or against it (and therefore in favor of cost leadership).

We derive from this the recommendation that automotive companies pursuing a differentiation strategy should make decisions on outsourcing on the basis of competences in order to counter a shift in the ratio of the production to the knowledge boundary due to the subcontracting of production and subsequent loss of knowledge. We studied the ratio of the production to the knowledge boundary depending on the necessary competences and assumed that automotive companies can pursue two dynamic strategies as a precaution against risk in changing markets: on the one hand, the outsourcing of value adding activities to reduce the need for finance in the event of technological change and to shift risks to suppliers, and on the other, the insourcing of value adding activities and development of competences in order to be able to respond to changes internally. Here, too, the decision depends on the achievable price premium and therefore on the strategy. If a company decides in favor of higher in-house value added in order to command a price premium, it needs permanent lean optimization in a highly competitive environment, by means of process optimization measures among other things, in order to compensate for cost disadvantages due to forgone specialization advantages.

2. Securing the price premium

If knowledge and therefore competences fall, so does the price premium. Our studies prove that the price premium in the German market has dropped considerably in the last 20 years, disproportionately so in the high-end market segments.

A price premium is paid for an extra benefit (e.g. brand image or quality), even if this benefit mostly cannot be quantified. In the narrower sense, a price premium therefore goes beyond the pure added value of a brand, in the broader sense brand value is also a justification for a price premium.

Automotive companies develop marketing strategies to achieve differentiation from the basic technical performance through higher-quality products.

The achievable price premium in Germany is nevertheless dropping further and further. There are several reasons for this:

1. With increasing differentiation of vehicle types, the value (exclusivity) to the customer often declines. Undifferentiated identical part strategies mean that vehicle differentiation can no longer be maintained and weakens as costs fall.
2. The automobile is losing its importance as an image factor, status and lifestyle object in Germany because
 - A trend towards more rational customers is emerging, as in France, for example, where the per capita income is similar but smaller automobiles are purchased than in Germany (most of them in the Polo class (e.g. Clio) and not in the Golf class).
 - On the other hand, the automobile is falling more and more in the rankings as a status symbol with young first-time buyers, behind travel, cellphones and leisure time activities. This is having a massive impact on the purchasing behavior of younger automobile purchasers.
 - The expansion of rapid transit and long-distance travel by rail, e.g. through high-speed tracks, means that the (premium) automobile designed for long distances is no longer being used and smaller city vehicles are being purchased (as in France and Japan).
3. In the face of automobiles' declining differentiation potential, price pressure is increasing. As a result, new players from low-wage economies are increasingly becoming competitors, which further increases the price pressure.
4. German automobile customers are buying smaller vehicles partly because they are becoming more environmentally aware and the price/performance ratio is being improved in company cars by reductions in engine power, extras and often even the vehicle class. The emission standards set by the EU for 2015 and 2020 reinforce this trend.

With price premium that secures market segments, limits the unit sales volume of products with a price premium, reduces customers' price sensitivity and reduces the indirect costs of refinancing, we have developed an approach to securing the price premium and improved it further last year by identifying automotive companies that implement this strategy particularly effectively.

II. Building new competences in electric mobility

In its interim report, Working Group 6 "Training and Qualification" of the German National Platform for Electric Mobility (NPE AG 6) already demanded new competences for electric mobility and in its second report of June 2011 once more called for an "electric mobility" competence roadmap in academic and vocational education and training.

So far, principally technical challenges in the transition to electric mobility are being examined and developed, including possibilities for improving the range and charging time of the battery, the infrastructure and battery components. This is necessary in order to close the technological gap for German automotive companies, e.g. in battery technology or power electronics. Business questions, e.g. about customer acceptance and the willingness to pay for such vehicles and about new business models in the transition to electric mobility are, however, just as important in order to remain automotive value added in Germany which goes significantly beyond R&D and distribution.

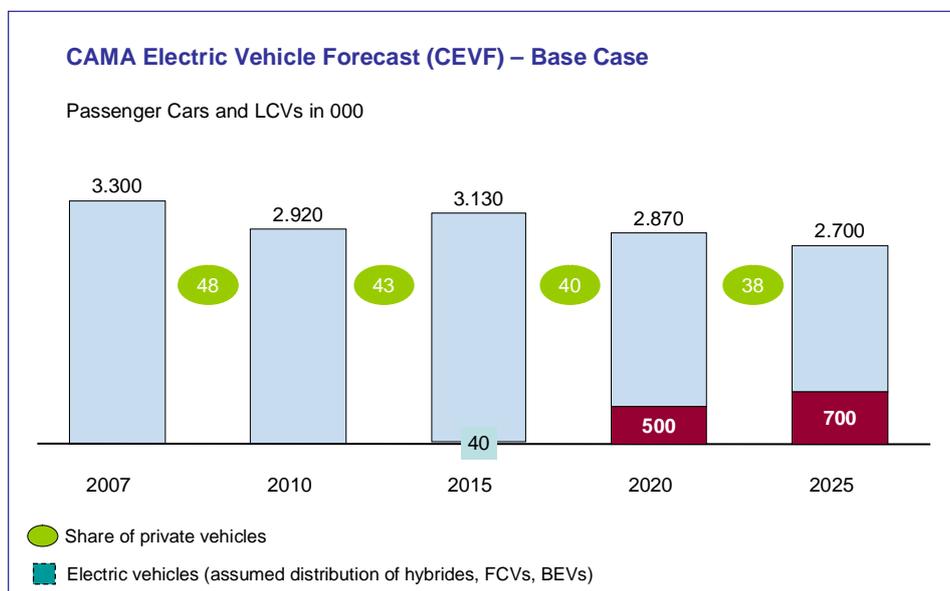
Building on our 2010 research on the acceptance of and willingness to pay for electric vehicles (maximum price: EUR 25,000), on a model for the transition to electric mobility (with three phases: development, breakthrough at a market share of 5 percent and convergence phase of market penetration) and on the differences between the individual BRIC countries in this transition because of their different framework conditions, we worked in 2011 on the following topics:

1. A forecast of the development of the German market for electric mobility e.g. to be able to estimate more accurately the tipping point to the new technology and therefore the breakthrough phase. It explains the need to build competences for a growing electric mobility market.
2. A market analysis of pure battery electric vehicles. This shows the discrepancy between current electric vehicles and customer requirements, which has to be eliminated through new competences.
3. Future mobility trends that show that further competences have to be built beyond new vehicle concepts and
4. The need for new ambidextrous management competences in the transition to electric mobility.

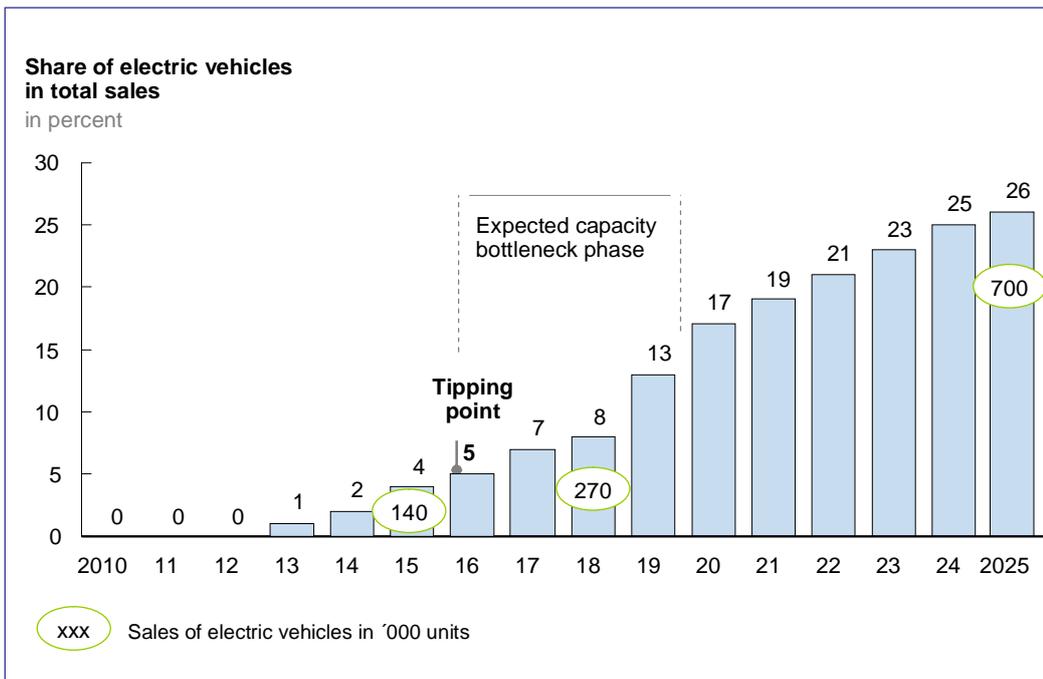
1. Building competences in a growing electric mobility market

Forecast of the German market for electric mobility

Our CAMA forecast of the development of the German market for electric vehicles, which also includes hybrid, battery-powered and fuel cell vehicles, although the hybrid technology will only be a bridge technology due to its complexity and the high production costs, confirms other research results and statements by the automotive industry before and at IAA 2011: electric vehicles are coming. There is a global research and development race going on for competences and market leadership not only in the area of batteries, but also new drivetrain technologies and new materials. In the German automotive market, which is shrinking mainly because of demographic trends and the changing mobility and consumer behavior of young people in particular, the share of electric vehicles will rise from around 4 percent in the year 2015 to 17 percent in 2020 and 26 percent in the year 2025. This means that around 500,000 electric vehicles will be sold in Germany in the year 2020 (base case scenario). The forecast is based on the detailed estimate of purchasing probability by (private and business) customers in various segments, depending on the expected cost and value of electric mobility.



Whereas around 1.4 million vehicles were sold to private customers in Germany in 2010, unit sales will decline by 2020 by around 18 percent to around 1.15 million. As a result, business customers will become more and more important to electric mobility's breakthrough. CAMA's forecast of the development of the German market for electric vehicles leads to the expectation that in the second half of this decade, 2016 to 2019, production bottlenecks may delay the new technology's market breakthrough for German manufacturers in particular. Especially commercial customers with relatively low range requirements on average are showing a growing interest in electric vehicles, 70% of them from German production. It is to be feared that German automotive manufacturers will be unable to develop this potential demand.



From 2013 onwards, the share of electric vehicles will increase at an accelerated pace with the market launch of such vehicles by German manufacturers (including BMW, Daimler and Volkswagen). The tipping point for investments into electric mobility is expected in 2016, in other words, that is the time when automotive companies' R&D budgets will be redirected primarily to electric mobility. A second significant acceleration of market penetration is expected in 2018, manufacturers will then have differentiated their offerings and offer whole product families. The Federal government's goal of putting a million electric vehicles onto German streets in the year 2020 will be clearly achieved in our base case, with 1.7 million vehicles.

2. Building competences to reduce the gap between the offerings of electric vehicles and customer requirements

Market analysis of pure battery electric vehicles

We conducted a market analysis of battery electric vehicles at a total of 838 private households and 296 businesses in Cologne between November 2010 and September 2011. We subsequently extended the survey and added four cities in the Ruhr and the district of Wesel. The analysis is not yet quite complete.

In addition to the finding that the willingness of both private and commercial customers to pay for a purely battery-powered vehicle was around EUR 10,000 below the price at which such vehicles are offered, the market analysis of pure battery electric vehicles offers answers to further research questions:

1. Are the prerequisites for the use of pure battery electric vehicles in place for both private customers and commercial customers?
2. How much is the maximum that customers are willing to pay for pure battery electric vehicles?
3. What economic policy measures are expected in the transition to electric mobility, and can they reduce the cost difference between pure battery electric vehicles and vehicles with internal combustion engines?

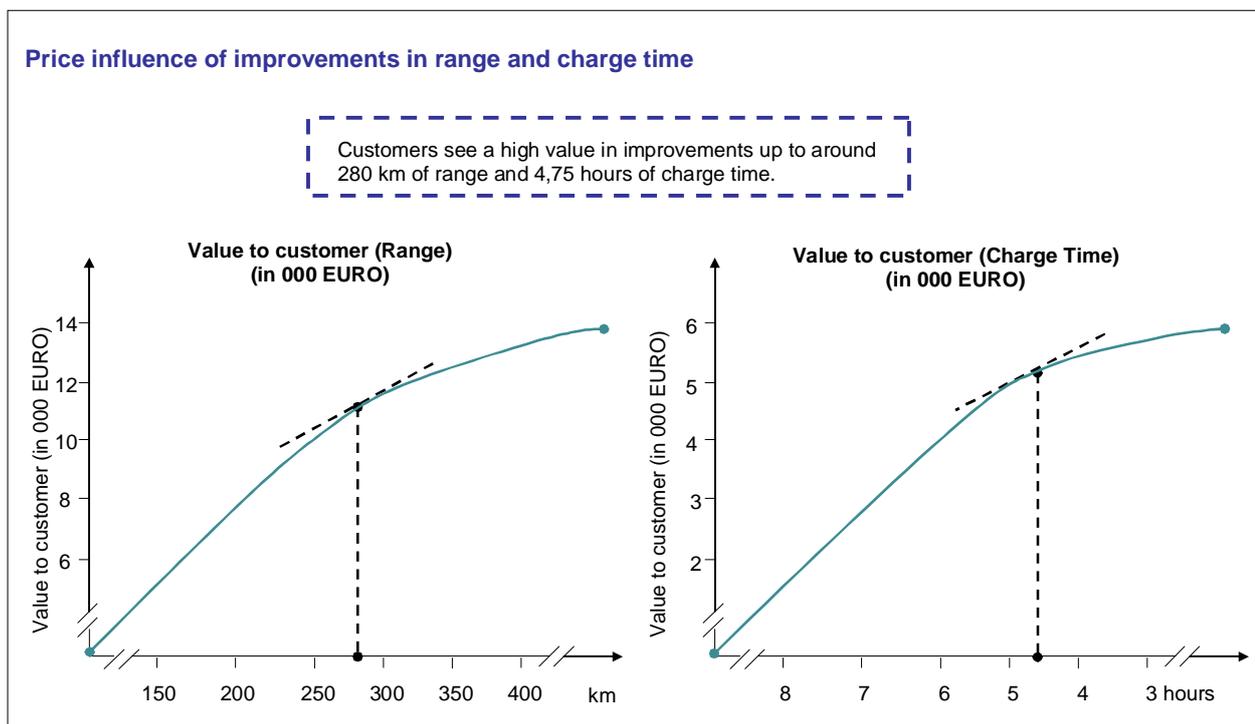
1: The prerequisites for a broad market launch of pure battery electric vehicles are in place in Cologne. More than 90 percent of the private customers surveyed drive less than 50km per day. The use of pure battery electric vehicles with a range of only around 130 kilometers is therefore no objective impediment to a purchase. More than 90 percent of respondents leave their cars unused for more than 8 hours per day. Even the existing very long charge time is not an argument against electric vehicles in principle. The respondents rated pure battery electric vehicles mainly as positive. More than 70 percent rated them as positive or even very positive. Only 8 percent gave a negative assessment of pure battery electric vehicles. Almost half of the respondents could imagine themselves purchasing a purely battery-powered electric vehicle within the next three years, 30 percent at a later date. One fifth were undecided.

In contrast to the private customers, the prerequisites for broad market introduction of pure battery electric vehicles are not consistently fulfilled for the Cologne business owners surveyed. Of the 296 business people surveyed, 60 percent showed unfavorable use profiles for pure battery electric vehicles. Driving patterns of more than 100km per trip and a normal stand time of less than eight hours between individual trips made the use of pure battery electric vehicles difficult. The basic attitude towards pure battery electric vehicles can be assumed to be very negative with this customer group. In contrast, of those business people with favorable use profiles for pure battery electric vehicles, 80 percent could imagine purchasing at least one such vehicle. For example, large architectural offices, advertising agencies and hotels are very open to the idea of pure battery electric vehicles.

2: The statements about willingness to pay refer to vehicles with a standard package, a 16kWh lithium ion battery, a charge time of eight hours, a range of 150km and a maximum speed of 130km/h. The maximum price that private customers among the respondents were willing to pay for pure battery electric vehicles was EUR 25,500. This result showed a high correlation with income. There were major differences between the municipal districts and areas of Cologne. The districts of Lindenthal and Rodenkirchen showed a willingness to pay the highest price for pure battery electric vehicles at EUR 35,000, districts in the north and east of Cologne revealed the lowest price at less than EUR 20,000. A strong correlation could also be found between the maximum price that people were willing to pay for pure battery electric vehicles and the respondents' gender, age, level of education, income, level of knowledge about pure battery electric vehicles and interest in environmental and energy issues. Women would like to spend a maximum of EUR 23,000 on an electric vehicle, men, in contrast, would pay up to EUR 27,500, i.e. 20 percent more than women. However, the higher purchase probability for women is important to the market launch and chance of sales of electric vehicles. Another important factor is that the over-50s displayed willingness to pay the highest maximum price: EUR 33,500 for 50- to 59-year-olds, EUR 32,500 for over-60s. The probability of purchase is also highest in this age group, at 68 percent for 50- to 59-year-olds and 77 percent for the over-60s. The maximum that people are willing to pay and the probability of purchase

increase with the level of education and – as was to be expected – are strongly determined by income.

For business people, the evaluation of pure battery electric vehicles was very heavily dependent on usage and costs (acquisition and operating costs). The upper price limit, at EUR 22,300, was approximately EUR 3,000 lower than for private customers. Technical progress and the “green” image of electric vehicles represented important selling points in favor of electric vehicles for many business people. Electric vehicles signal openness to innovations and social and environmental responsibility. Service providers in particular showed great openness here. The upper price limit lay between EUR 23,500 and EUR 28,500. Social services did not have the financial resources for vehicles which would be very advantageous for them because of their relatively low range requirements. The upper price limit here was EUR 19,500.



The correlation between price, range and charge time was also very revealing. An improvement in range from 150km to 200km leads to a willingness to pay EUR 2,000 more, an improvement in range from 150km to 250km actually to EUR 3,800 more. The respondents see a high value in improvements in range up to around 280km and charge time down to 4.75 hours, with a higher range or shorter charge time the added value of the improvement declines again for them.

3: Political players were asked to answer this question. Despite the difficulty of naming probable economic policy measures to promote electric mobility in the next decade by the European Union, the German Federal government, the German regional governments and the municipalities in light of major structural and other changes, the survey revealed two trends:

- Development (subsidies) has priority over restriction (sanctions):
the majority of the experts expect the focus of public development support to lie in non-monetary measures in the market launch phase of electric vehicles, and not so much in further restrictions on vehicles with internal combustion engines. Measures to restrict vehicles with internal

combustion engines are only seen as supporting tools to reduce the cost difference between the competing drive technologies.

- Market has priority over state:
regardless of the persistent hype about electric vehicles, virtually all political players see it as an important principle for the development of modern drive concepts that the development support measures should be open to all technologies. Electric mobility appears to be important and is not seriously challenged, however, it is not clear whether it will be the only drive technology of the future. Ultimately, the market and the customers will decide which drive technology will become established in the long term.

Both trends reflect the attempt on the one hand to promote the transition to electric mobility actively, but on the other hand not to restrict the market economy and therefore competition between the internal combustion engine technology and other forms of drive. The strong market position of German automotive companies in particular in internal combustion engine technology can be used going forward in such a way that remaining improvement potential is tapped and at the same time the transition to electric mobility is encouraged by non-monetary measures.

The market analysis shows that the present vehicles are not yet in line with the customers' wishes. There is a competence gap here which should be closed by using technical possibilities and degrees of freedom in the design of electric vehicles.

3. Building competences for new vehicle and multimodal transportation concepts - future mobility trends

At the 3rd Wissenschaftsforum Mobilität, attended by around 200 experts from academia, business and politics in Duisburg in July 2011, a wide range of future developments in mobility were addressed in 43 academic papers. However, three important development trends for future mobility can be identified from these.

1. The reduction of (smaller) vehicles to functionality as a response to changing customer wants and more rigorous environmental requirements.
2. Changed mobility behavior in the framework of comprehensive mobility concepts and
3. The technical upgrading of premium vehicles in particular through mobile communication and technological innovations.

The automobile will lose ground generally as a status symbol, not only with the younger generation. Together with the more rigorous environmental restrictions, particularly in the EU, the trend is moving towards smaller vehicles with standard features. Even if many younger people do not have the financial resources for a new car, the very small share of under-30s in new car registrations in Germany in the first half of 2011 at 3% (!) is a clear sign that iPhone 4 or 4S are abbreviations of more importance to them than GTI or GSI.

Individual transportation is decreasing in relation to other forms of transport (air travel, long—distance rail, public rapid transit systems, two-wheelers) and to alternative transport concepts (e.g. car clubs). Premium vehicles are constantly further upgraded and personalized technically, e.g. by the integration of mobile communication, route planners, mobile Internet and innovations in automotive engineering (e.g. emergency brake and evasion systems for long-distance driving, particularly in vehicles of the upper middle, upper and luxury classes, but increasingly also in smaller premium models).

These development trends in (electric) mobility are to be set in train in 2012. Progress in manufacturing technology, the acquisition of new competences, new mobility concepts and the new international intra-company allocation of work will be discussed at the
4th Wissenschaftsforum Mobilität – Steps to Future Mobility
at the inHaus-Zentrum in Duisburg on 21 June 2012.

The results show that broad competences in mobility, particularly in the field of multimodal transportation concepts, have to be built up with the transition to electric mobility.

4. Building ambidextrous management competences in the transition to electric mobility

It was emphasized above that automotive companies need business competences in the transition to electric mobility as well as technical ones, and not merely because the German market for electric mobility is growing. Market analyses of pure battery electric vehicles show that the prerequisites for their use, particularly in the ever more important commercial sector, are not yet sufficiently in place and that willingness to pay for them is still well below the offer price and mobility is changing.

New competences for the management of electric mobility are also needed. Under long-term, radical discontinuous change in the transition to electric mobility, in addition to the business models for the existing technologies, for which resource improvement (exploitation) is the foreground issue, new business models are put in place for the new technologies, for which resource renewal (exploration) is of central importance. Resource exploitation and exploration lead to conflicts because their goals are different. These goal conflicts can be handled by ambidextrous management. Surveys of industry experts, academics and top managers show that automotive manufacturers and suppliers have a similar picture of the phases in which the transition to electric mobility will be completed, but that they assess the need for ambidextrous management differently. Almost 100 in-depth interviews demonstrate that the radical nature of the changes and the importance of ambidexterity depend on a company's competence base: Suppliers are often more dynamic than OEMs, so that the management of ambidexterity does not represent a major additional challenge for them.

III. Building new competences for new growth markets

The automotive companies are currently massively increasing their value added in the new growth markets, particularly China, despite the risk of loss of know-how. High foreign investments are required to secure a company's global market position and cover the large markets, particularly the Chinese market. These investments are not into production only, but also into other value adding activities such as research and development.

The management of the globally operating automotive manufacturers and suppliers therefore has to be adapted to the changing importance of the large foreign subsidiaries and the autonomy of these subsidiaries has to be strengthened, e.g. by creating centers of competence. Such centers of competence increasingly include the regional integration areas (particularly ASEAN in Asia and MERCOSUR in South America), strategically and organizationally. The international allocation of work is therefore changing in multi-national companies.

Up to now, the subsidiaries' value adding activities were largely restricted to single foreign markets despite the regionalization in east Asia, Latin America and sub-Saharan Africa, and interaction among the subsidiaries was low compared to the exchanges between the subsidiaries and the parent company. The principal reasons for this are internal transfer pricing and tight, central management by the parent companies. Discussions with experts in the subsidiaries of German automotive companies in China in 2010 showed, for example, that the Chinese locations are still relatively uncoordinated and form relatively isolated value adding units. Multinational strategies and structures can be mapped in the area of conflict between global integration and local adaptation.

With the increase of value creation in the foreign markets, the role of the subsidiaries is changing. Additional coordination requirements between the subsidiaries and the parent company are arising. Global competence management that links global competences, local autonomy and internal innovation and learning effects is becoming more important. In addition to internal transfer prices, other important coordination mechanisms are knowledge transfer and shared values.

IV. Future research projects

Our research results in the year 2011 show that the management of competences constitutes a major challenge for international automotive companies. On the one hand, they have to further develop traditional competences in internal combustion engine technology, while at the same time they have to build new competences in electric mobility and on foreign growth markets, and also have to manage these parallel tracks ambidextrously.

Our future research projects will also be based on these research topics:

- Securing competences in the traditional internal combustion engine technology
- Building new competences in electric mobility
 - Forecast of the international markets for electric mobility and analysis of the international competitiveness of German automotive manufacturers in electric vehicles
 - Further evaluation of the market analyses on purely battery-powered vehicles, e.g. on the charging infrastructure, and comparison of the results in Cologne with the results of other cities and districts in North Rhine-Westphalia
 - Deepening the research into new mobility trends
 - Analysis of new business models in the transition to electric mobility
 - Development and testing of future vehicle concepts with electric motors which accord with customer wants and the technical possibilities and use degrees of freedom in design resulting from the elimination of internal combustion engine technology
 - Analysis of the special importance of dynamic strategies such as risk, price premium and alliance management in the transition to electric mobility.
- Building new competences for automotive growth markets
(further research into the change in the management of subsidiaries of automotive multinational companies)

We will be happy to supply further information about the research projects:

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