The coming transformation of the automotive industry

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The automotive industry is going through a crisis unprecedented in its century-long history. Optimistic commentators predict that strong demand from the BRIC countries and growing market penetration of hybrid or electrical vehicles will propel the industry back to growth in the wake of the financial crisis. A more comprehensive analysis on key drivers indicates that we are instead nearing the end of the global automotive industry as we know it.

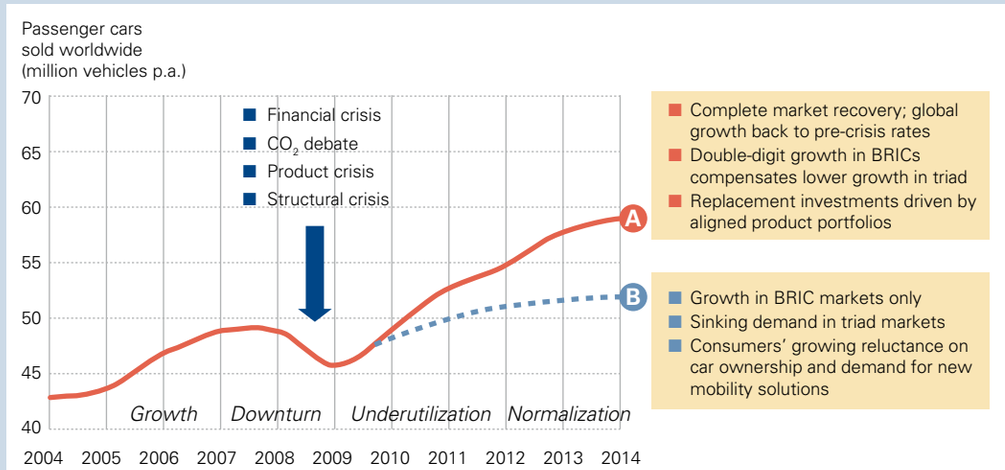
The automotive industry is caught in the middle of a crisis of unprecedented magnitude. The entire industry is paralyzed as various players disagree about whether the crisis has bottomed out already. While enormous government subsidies have fueled recent recoveries in the US, Europe and China, the outlook for automotive markets around the world is still unclear.

Until recently, the automotive industry was predicting a complete market recovery and a return to former growth rates after riding out the current crisis (see Table 1). Two drivers were cited for this hoped-for recovery: strong demand in the BRIC countries and increasing market penetration of hybrid or electrical vehicles.

This hopeful prediction overlooks the fact that the financial crisis was certainly not the sole cause of the massive collapse in car sales. Customer demand was already changing fundamentally, rooted in growing concerns about climate change and the skyrocketing oil price, before the crisis broke. While these two well-known long-term trends with global impact had not attracted much attention from the automotive industry until then, they led to a noticeable weakening of the market and considerable segment shifts from big, luxurious to smaller, fuel-efficient vehicles.

We are now near the end of the global automotive industry as we know it. In this article we will first highlight the four drivers of its coming transformation: consumers' changing mobility preferences, government intervention related to the environment and industry structure, technology shifts and the upheaval in the competitive landscape. We will then explore how these changes will affect the rules of the game and what today's leaders should do to stay on the winning side.

Table 1 **Two scenarios for passenger car sales development**



Source: Global Insight, Feb. 2009, World market Passenger Cars without LCV; Arthur D. Little study "The Future of Mobility 2020"

Consumers' changing mobility preferences

Especially in the triad markets (North America, Europe and Japan), car ownership in most segments has been a status symbol, with consumers continuously seeking horsepower and size upgrades. Today consumer demand is shifting towards lower-cost, individualized, environmentally friendly, easy-to-use and easy-to-access mobility. Several mega-trends with a horizon of 20 to 30 years and consumer trends with a horizon of 5 to 10 years are driving this shift (see Table 2).

Starting from these trends, future consumers can be grouped into various "mobility types" as a function of the car and mobility concepts they prefer.

Let's take the "mobility" mega-trend, for example. It describes the strong quantitative growth in mobility and the expansion of consumers' mobility radius in the triad markets over the last 30 years. This trend is now visible in the emerging markets too. But the gigantic benefits of increased mobility have to be put against the negative effects of pollution and congestion. Innovative car concepts alone will not get us out of this quandary. Vehicle-linked mobility will have to be integrated with other mobility forms. Consumers increasingly expect mobility solutions that fit with their personal attitudes toward life. They are looking for individualized car concepts and innovative mobility concepts that go beyond the automobile.

Starting from these trends, future consumers can be grouped into various "mobility types" as a function of the car and mobility concepts they prefer. These preferences in turn are shaped by consumers' sociological environment and lifestyles. We have identified seven mobility types for the triad markets and three for the emerging markets (see Table 3).

Let's take the "greenovator" mobility type, for example. It is probably the predominant type for the triad markets, making up just under 30 % of the total market there in 2020. Greenovators link environmental awareness and a sustainable lifestyle directly with their quality of life. Restraint in consumption and luxury is an essential component of their understanding of culture and life – with obvious consequences for mobility consumption. They are primarily interested in intelligent, sustainable and to some extent even ascetic car concepts. They will put more complex demands on mobility products and services. They want integrated ecological mobility concepts that are oriented towards both their own personal well-being and the good of society.

Table 2 **Trends affecting consumer demand**

Megatrends (20 to 30 years)		Consumer trends (5 to 10 years)	
Female shift	Participation of women in out-of-home activities	Downaging	Third phase of life is active
Individualization	Consumers' disengagement from mass movements	Simplify	Consumer wishes purity and simplicity
Silver revolution	The economic and political power of retired people	Deep support	Consumer looks for integrated support
Globalization	Interdependence of the world's markets and businesses	Family 2.0	Family configurations change regularly
Neo-ecology	Environmental responsibility at individual and company level	Multi-life paths	Life is a sequence of diverse experiences
Connectivity	Anywhere anytime access to information and people	New luxury	Individual freely deploys his or her own time
Mobility	Expansion of the mobility radius of individuals	Neo-cities	Urban design focuses on zero-emission
		Cheap chic	Design appears in all price segments
		Greenomics	Consumers pursue a holistic lifestyle

Source: Arthur D. Little study "The Future of Mobility 2020"

Table 3 **Mobility types 2020**

Mobility types triad markets	
Greenovator	■ Takes into account the socio-ecological consequences of mobility ■ Demands innovative and sustainable solutions
Family Cruiser	■ Heavily depends on mobility in an increasingly fragmented network of family and friends
Silver Driver	■ Actively engages in the third phase of life ■ Has ample product experience and a high quality awareness
High-Frequency Commuter	■ Has an everyday life characterized by high mobility frequency ■ Needs mobility predominantly in tomorrow's mega-cities
Global Jet Setter	■ Needs global mobility as a prerequisite for fulfilling the job ■ Demands exclusive premium support
Sensation Seeker	■ Looks at mobility as a symbol of liberty, a fun lifestyle, status and prestige
Low-End Mobility	■ Has a limited mobility budget and needs mobility solutions ■ Is ready to downgrade mobility requirements

Mobility types emerging markets	
Premium	■ Status, prestige, comfort ■ Differentiation as winner
Smart Basic	■ Low-priced medium-class products ■ Possibility of individualization
Basic	■ Basis mobility ■ Simple and cost-effective products ■ Preference for nationally produced products

Source: Arthur D. Little study "The Future of Mobility 2020"

In the emerging markets similar mobility types are appearing to those that arose in the triad markets over the last 20 years. However, consumer requirements will include environmental correctness and efficiency. The "basic" mobility type will account for almost half of the automotive mobility market in the emerging markets in 2020. They consume mobility primarily to eliminate a lack of autonomy and enlarge their mobility radius. Automotive manufacturers who want to succeed in the mass markets of the future must offer economical and cost-effective vehicles, and increasingly so with alternative drivetrains. Modern technologies and electric cars may be much more successful at penetrating Asia's mega-cities than those of the triad markets.

Government intervention related to the environment and industry structure

Political intervention – tightening emission standards, consumer incentives and taxes, and mobility restrictions at city level – has become a key driver of consumer behavior in automotive markets globally. It has also spurred the development or, in some instances, ensured the survival of existing industry structures.

National governments and large cities set regulations and introduce specific measures. Today a heterogeneous mix of non-harmonized incentives and penalties is in place. They have a significant impact on the country-specific total cost of ownership (TCO) of a vehicle. TCO differences between countries easily run to €10,000 per year. Accordingly car manufacturers must fulfill the local legal requirements and align their product portfolios with local regulations to stay competitive.

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Notable TCO differences between countries are everywhere. Take the car-scrap programs, for example. While some countries, such as Germany, have not linked the car-scrap bonus to emissions, other countries, such as France, the US and China, have graded the bonus according to carbon emissions or incentivized the purchase of electric vehicles. Likewise, strategies to regulate access to urban areas differ between cities. They include charges based on the number of entrances (e.g., London and Stockholm) or emission class (e.g., Milan), low-emission and environmental zones (e.g., Stuttgart and Berlin), and transit restrictions for trucks (e.g., Berlin). While the strategies may differ, the political pressure from mega-cities will increase.

A different ballgame is government aid for selected car manufacturers such as GM, Ford, Chrysler and Opel. While these interventions may postpone the rise in unemployment, they do not address the lack of competitiveness of a number of manufacturers nor the overcapacity in the industry. The more promising way to support the automotive industry is investment in new technologies and business models, such as electric vehicles and e-infrastructure. But government aid is not limited to ailing Western powerhouses. The Chinese government especially is supporting its local automotive industry substantially to help it to become a relevant actor within the global industry.

Technology shifts

The two drivers discussed so far – changing consumer preferences and government intervention – are in turn driving tremendous technology investments that will definitely lead to major changes in the industry. The bulk of technology investment is going into the development of low-consumption and low-emission vehicles.

The need for a re-think is particularly acute for electric vehicles. While consumer awareness and expectations around the globe are high, there is still a great deal of uncertainty about market forecasts for electric vehicles, attainable market prices and economic feasibility for the providers.

While the goal is clear, the same cannot be said about the technology roadmap to get there. A multitude of technologies are being developed in parallel, covering areas such as lightweight materials, aerodynamics, transmissions and power trains. This uncertainty poses a dilemma for car manufacturers. On the one hand they need to spread their bets, but on the other they cannot bear all the technology-induced costs, especially in tough economic times. Accordingly more and more manufacturers realize that a purely evolutionary approach to solving today's challenge will be insufficient.

The need for a re-think is particularly acute for electric vehicles. While consumer awareness and expectations around the globe are high, there is still a great deal of uncertainty about market forecasts for electric vehicles, attainable market prices and economic feasibility for the providers. The doubts about market success are quite alarming given the billion-dollar investments that most automotive companies are currently undertaking in this area.

As a consequence, all players involved in the electromobility value chain will need to re-define the business model. Utility companies, automotive OEMs, battery suppliers, mobility providers such as rental car companies, city authorities and many other players will have to cooperate in order to set up a viable business model. At the beginning of the twentieth century, when the infrastructure for gasoline fuels had to be set up for the then-emerging automotive markets, the automotive industry took on its current form, with OEMs, suppliers and fuel retailers. This structure has prevailed until now. But a successful technology shift towards e-mobility will reshape the industry. Business model innovation will have to happen at the very same time as technology innovation, because the historically grown assets, competencies and organizations of the traditional players represent strong barriers to a real technology shift.

In this respect the emerging markets may have an advantage over the triad markets. The former's automotive industry structures are still very young and strongly influenced by government coordination. New player formats and business models might emerge much more quickly than in the triad markets. In the latter, it is highly unlikely that the traditional automotive OEM-supplier model will be able to cover development, production, marketing, aftersales, infrastructure, energy generation and provisioning, billing, flexible usage models and financing of e-mobility, at an acceptable cost and price level. E-mobility will change much more than just the inside of the car. Several historically separate industries will have to converge.

The emerging markets may have another advantage related to consumer acceptance of electric vehicles. While many consumers claim to be looking forward to using (and buying) electric vehicles, very few have any personal experience with them. It may be much easier to explain the limitations of electric vehicles to consumers who have never owned a conventional vehicle. As a result, emerging markets may become the leaders in e-mobility.

The upheaval in the competitive landscape

E-mobility will change much more than just the inside of the car. Several historically separate industries will have to converge.

Competitive pressure both from the outside and from within is changing the contours and structure of the automotive industry radically. First, the emergence of new business models related to e-mobility is inviting new competitors into the market. Second, the search for economies of scale is driving consolidation among OEMs and suppliers. Third, selected OEMs from China will work their way up into the global top league. Let's have a more detailed look at these three factors.

New entrants vying for a place in the e-mobility space

As we have indicated above, the emergence of new e-mobility business models is blurring the boundaries between hitherto separate industries. Accordingly new competitors

will enter the market from diverse corners. The first group of new entrants are product manufacturers, either OEMs (e.g., Tesla in the US or BYD in China) or component suppliers (e.g., Panasonic-Sanyo or Toshiba for batteries). The second group are mobility service providers who build an e-vehicle infrastructure and plan to become the gatekeepers between the OEM and the consumer. Better Place, for example, purchases the electric cars while the consumer buys a kilometer range – the equivalent of the pre-paid card for mobile phones. The third group are utility companies that partner with automotive OEMs to build an e-vehicle infrastructure. These are pilot projects between single OEMs and utility companies (e.g., RWE with Smart, and Vattenfall Europe with Mini in Berlin) or more broad partnerships between several OEMs and utility companies (e.g., Nissan, Mitsubishi and Fuji Heavy Industries with Japan's largest utility company TEPCO). The fourth group are cities that evaluate new public-private partnership models to provide a fleet of vehicles in a car-rental/sharing model for inner-city traffic (e.g., the Autolib concept in Paris).

The push for economies of scale is inexorable: the introduction of new technologies pushes up R&D and production costs; the trend towards lower new-car budgets erodes manufacturers' margins; and the industry is plagued by overcapacity.

Consolidation among OEMs and suppliers driven by economies of scale

The push for economies of scale is inexorable: the introduction of new technologies pushes up R&D and production costs; the trend towards lower new-car budgets erodes manufacturers' margins; and the industry is plagued by overcapacity. As a consequence, the industry will consolidate both at OEM and supplier level. The financial crisis may have accelerated the demise of several well-established companies (e.g., Karmann, Visteon, TMD Friction and Edscha), but industry redesign will continue after the crisis.

The rise of selected OEMs from China into the global top league

The Chinese national government will encourage a huge wave of consolidation among today's 100 or so Chinese OEMs. We expect about five OEMs from China and potentially Tata from India to join the club of global OEM champions in the future, some of them possibly growing to about one and a half times the size of BMW or Daimler and as big as Renault, Fiat, Suzuki and the like.

To get there, the Chinese OEMs will follow a carefully crafted strategy consisting of three parts. The first part concerns the geographic path they will follow. Initially they will focus on their home markets with the aim of becoming market leaders with own-brand products in the middle segment, thereby displacing the current joint ventures with Western OEMs. Then they will address emerging markets beyond their home turf, especially in two-tier markets in Asia, the Middle East and Africa with similar customer requirements. Finally, they will compete head-to-head in the triad markets and move their way up from low-price segments to mid-price segments.

The second part concerns their interest in next-generation powertrain technologies such as plug-in hybrids and electrical or fuel cell drivetrains. Chinese OEMs and government acknowledge that cleaner vehicles are key for environmental protection. Furthermore, they see alternative energy vehicles as the key to competing with or even leapfrogging the established players. They are committed to closing the gap as soon as possible.

The automotive market will gradually evolve into a mobility market. Changing consumer preferences, targeted government policy, major technology shifts and increasing competitive pressure on the traditional OEMs are shaking the fundamentals of the automotive industry.

To close this gap, the third part is vital, namely the acquisition of critical technology and know-how through takeovers of OEMs, suppliers or engineering service providers. While the recent Chinese bids for Opel, Volvo and Saab are highly visible, taking over struggling Western OEMs is not their primary choice given the high risks. Most M&A activity by Chinese OEMs will focus on suppliers, ailing contract manufacturers and design and engineering service providers (e.g., Geely's acquisition of Australian transmission supplier DSI; Beijing Auto's interest in Delphi, the American autoparts giant; SAIC's acquisition of Ricardo 2010 Consultants Ltd.; Chery's reliance on AVL for engine development and on Italian design firms like Bertone or Pininfarina concerning exterior design).

Business models in the future mobility market

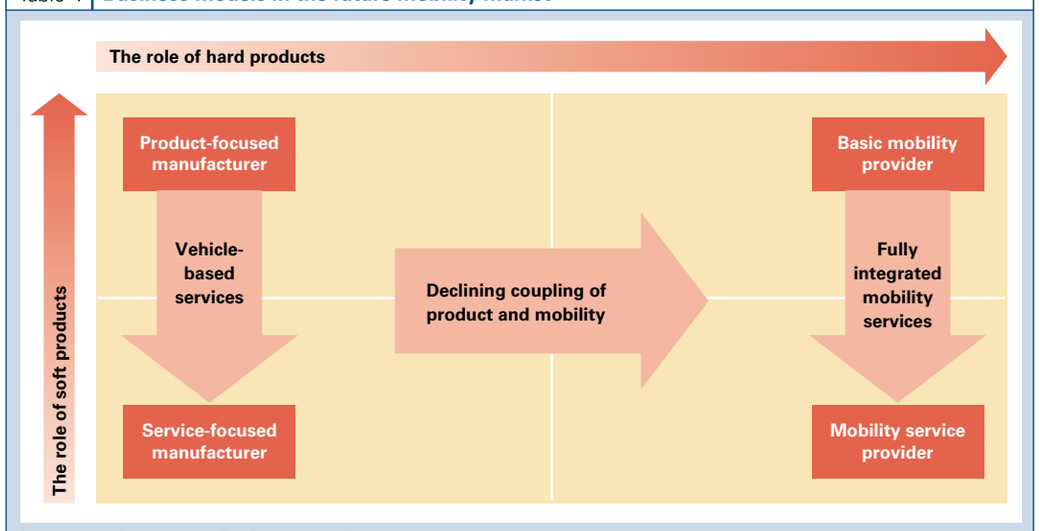
The combination of the four above-mentioned drivers leads us to the hypothesis that the automotive market will gradually evolve into a mobility market. Changing consumer preferences, targeted government policy, major technology shifts and increasing competitive pressure on the tradition-

al OEMs are shaking the fundamentals of the automotive industry. New business models will gain ground, primarily within the mature triad markets but also in progressive mega-cities in emerging markets.

Consumers will be less willing to invest money in mobility and commit to one product for a long period. Industry overcapacity and the rise of new OEMs onto the global stage will lead to even fiercer price wars. OEMs will have to shoulder massive investments in green technologies to match consumer demand and government regulations. Ultimately these drivers will put to the test the classical business model of producing and then selling cars to consumers.

Certainly a few automotive manufacturers will be able to maintain profitable margins with today's mainly product-related revenue streams. But the majority will have to find new ways to improve profitability by participating in the transformation of the automotive market into a mobility market. In order to identify profitable opportunities in the future mobility market, we have developed a model with two axes: the role of hard products and role of soft products (see Table 4).

Table 4 **Business models in the future mobility market**



Source: Arthur D. Little study "The Future of Mobility 2020"

The combinations of the end-points represent four "pure" business models. Of course, in reality automotive manufacturers will position themselves somewhere close to or between those pure models. Large automotive groups could even cover several business models by leveraging their brand and service portfolios.

The product-focused manufacturer

The product-focused manufacturer model is closest to today's automotive manufacturers in terms of content and structure. Their core competence is in product and manufacturing technology. Technology leadership is recognizable in all areas, from engine performance to lightweight construction concepts. Through their particular manufacturing competence they manage to produce simultaneously cost-effective and qualitatively high-value products.

Because selling hard products is their main source of revenues, we expect only a few types of manufacturers to thrive in this model:

- "High-end premium": manufacturers such as Porsche, Bentley and Ferrari may be able to sustain volumes and margins, as the global high-end premium market is expected to grow in absolute numbers.
- "Low-cost innovator": manufacturers such as Tata may prove their case with low-cost innovation in the conventional drivetrain space, or BYD with allegedly extreme low-cost positions within the electrical drivetrain segment.
- "Lean brand": these manufacturers basically translate the Dell computer concept into the automotive industry, by focusing on marketing, product specification and sales, while outsourcing product development, manufacturing and even service to available specialists and capacities on the market.
- Classical "volume champion": manufacturers like Volkswagen or Toyota that go for volume and economies of scale even more fully than today.

The service-focused manufacturer

Service-focused manufacturers provide mobility through a strong attachment to the core product, namely the automobile, just as product-focused manufacturers do. However, technology plays a more moderate role. By outsourcing large parts of manufacturing, they assume the role of system integrator in the value chain. They expand their service portfolio with a comprehensive offering linked to the core product. The vehicle is the platform that enables the marketing of a range of services to the consumer throughout the ownership cycle.

Service-focused manufacturers provide mobility through a strong attachment to the core product, namely the automobile, just as product-focused manufacturers do.

Service-focused manufacturers are the consumer's comfortable and central interface for all questions and services related to the product ("one-stop shopping"). They appeal to consumers who still want to acquire their individual mobility through a specific product but are demanding a comprehensive portfolio of services as well. Similar to Apple in the computer industry, they develop a unique selling proposition through design and individuality, with a comprehensive service that generates revenue throughout the customer lifecycle. The close integration of hardware and software is crucial for success: it enables a seamless, easy-to-use consumer experience *and* it erects switching barriers for the consumer.

The basic mobility provider

The basic mobility provider uncouples mobility from car ownership in order to optimally fulfill consumer requirements. Mobility no longer means car-mobility by default; the only thing that counts is efficient and inexpensive transport. A car represents merely one building block in a holistic mobility concept that the consumer can configure individually. Through "shared mobility", the consumer has de facto lower total cost than if he or she owned the car. Depending on usage, he will have significantly lower costs with a pay-by-use approach than with complete car financing. In addition, the cost structure is flexible for the consumer, i.e. he can directly reduce his monthly expenses by forgoing mobility if personal constraints compel or motivate him to do so. The auto-mobility share is covered by a standard car, while other mobility building blocks can be handled using public and non-individual means of transport. The standard car is less advanced in terms of technological criteria (drivetrain technology, comfort, safety) than other vehicles; the focus is primarily on practicability and cost efficiency. Electrical power systems, for instance, would be appropriate drive concepts. Basic mobility providers offer mobility without having to produce the cars themselves.

The mobility service provider

Mobility service providers uncouple mobility from car ownership completely, as the basic mobility providers do. However, the former in addition establish a diverse mobility service portfolio. Their core competence is the mastery and operation of complex customer relationships by integrating a cooperation network. By offering more services (e.g., online commerce and parking services) from just one provider, they make the consumer experience more comfortable. As a consequence, branding is crucial for them. New players could emerge here, but even existing and renowned car manufacturers could morph into this new identity, as the legendary case of IBM transforming from a personal computer manufacturer into a high-end service provider suggests.

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The future rules of the game in the automotive industry

Let's summarize what the forces and trends described above mean for the rules of the game in the automotive industry. As today's leaders develop strategies to stay on the winning side, they should incorporate four developments into their thinking.

The transformation of the automotive market into a mobility market

Especially in the triad markets, car ownership in most segments has been a status symbol, with consumers continuously seeking horsepower and size upgrades. But this attitude is changing. Consumers are looking for innovative mobility concepts that go beyond the automobile. They will be less willing to invest money in mobility and commit to one product for a long period. Mobility no longer means au-

to-mobility by default. The auto-mobility share is covered by a standard car, while other mobility building blocks can be handled using public and non-individual means of transport. OEMs will have to adapt to the fact that the standard car in this scheme may be technologically less advanced than the traditional car. They will have to explore what lifecycle consumer services could mean to them and how they should position themselves toward other service providers.

The fierce battle for the new global middle segment

As future growth is expected to come mainly from emerging markets, the centre of gravity of the automotive industry is shifting from the triad markets to emerging markets. As a result, vehicle specifications will differ from today's and price ranges will be lower than those the triad OEMs are used to. Emerging OEMs will become competitive, especially in the lower segments of the new global middle class. This will probably happen sooner rather than later as they acquire knowledge and get access to technology by taking over ailing Western OEMs, suppliers or engineering consultants. Chinese OEMs especially will become relevant competitors not only in the Chinese but also other emerging markets. Today's global OEMs must find ways to be even more competitive within the growth segments of the future – their 100 years' experience of developing increasingly advanced vehicles for Western markets may not help them solve the problem.

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A new value chain and industry consolidation

New business models and powertrain technologies – especially those linked to e-mobility – require a rethinking of today's automotive value chain. New competencies are required. Cooperation with new players such as utility companies, mobility providers, local authorities, software companies or telecommunication providers is required to offer consumers more comprehensive mobility solutions. At the same time, increased price and cost pressure strengthens the logic of economies of scale. In order to sustain profitability, industry consolidation will increase among OEMs and suppliers and within the automotive industry of the emerging markets.

E-revolution fueled by emerging markets

E-mobility is very high on the agenda in all established automotive markets and most global OEMs are investing heavily in e-traction R&D and pilot projects. Nevertheless emerging markets – mainly China – are likely to fuel the real e-revolution, for three reasons. The first reason is linked to consumer psychology and the limited range of electric vehicles. As most drivers in emerging markets are first-time car owners, they have not been spoilt by the long range of traditional cars. For them a 100-kilometre range is a big step forward in individual mobility. The second reason is the still-prohibitive price of electrical vehicles, even after taking subsidies or other consumer incentives into account. But Chinese OEMs such as BYD have already announced purchase prices below €20,000 for a plug-in hybrid or even a full electrical sedan. This is a fairly competitive price given the additional government support of up to €6,600 per vehicle. If these prices are validated in reality, e-mobility all of a sudden becomes competitive in China. The third reason is the Chinese government's wide-ranging authority to decide restrictions on combustion engine vehicle use or build the infrastructure required for e-mobility.

E-mobility is very high on the agenda in all established automotive markets and most global OEMs are investing heavily in e-traction R&D and pilot projects.

Insights for the executive

The automotive industry is being reshaped on a scale never experienced before. Four forces are shaking the fundamentals of the industry: changing consumer attitudes toward car ownership, targeted government policies related to the environment or industry structure, uncertain technology shifts especially in the field of electric vehicles, and increasing competitive pressure on the traditional OEMs both from new entrants and emerging market champions. As today's leaders develop strategies to stay on the winning side, they should incorporate four developments into their thinking and plans:

1. Anticipate the transformation of the automotive market into a mobility market, especially in the triad markets and mega-cities in emerging markets.

2. Define strategies to stay competitive with products targeted at the global middle segment, where the established OEMs will meet the winners from emerging countries.

3. Decide where and how to create most value, as economies of scale gain further importance, the traditional industry consolidates and new players enter the mobility market.

4. In order to participate fully in the electric vehicle revolution, don't ignore emerging markets, as consumer attitudes, cost positions and government push in those markets may be more conducive to its take-off than in the triad markets.

Until now most automotive companies have necessarily devoted their energy to coping with the immediate impact of the economic crisis. Now is the time to broaden the scope and prepare for the challenges of tomorrow.

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