

# Innovation Economics



“No. 1 challenge in innovation management?  
Fulfill the cost imperative.”

## Keep the system from collapsing

In industrialized countries, the price of the average new car has risen by 100 percent over the past 20 years while average income has increased only by 50 percent – and the gap between new car prices and incomes has continued to grow from year to year. The reason for this development is the increasing technological complexity that drives development and manufacturing costs, and the growing number of functions needed to differentiate the brands. This trend cannot continue much longer. Otherwise, customers could go back to smaller cars, a development that is not in the interest of the industry.

### Cost innovations

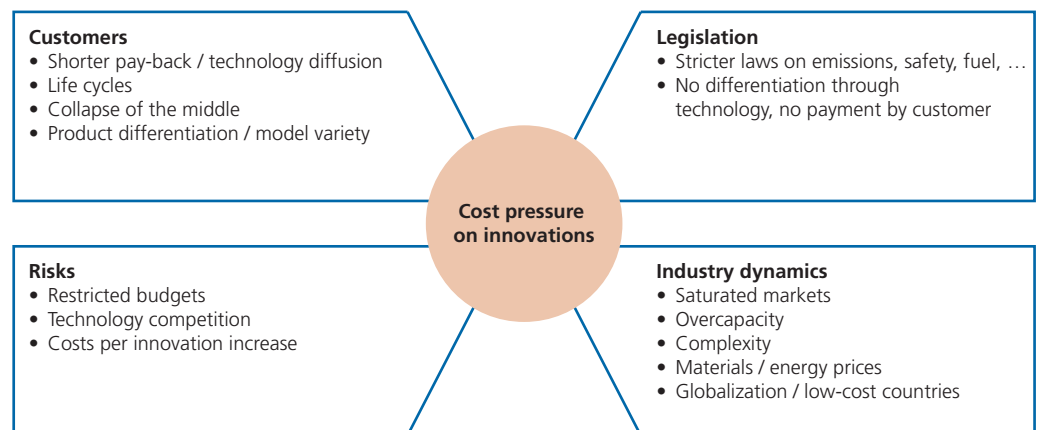
The automotive industry must put a much stronger focus on cost innovations. Otherwise, cars will become too expensive for customers.

Therefore, cost innovation is a central goal in the automotive industry, just as important as the traditional differentiation of functional innovations is. The heads of R&D at OEMs and suppliers have already embraced this new imperative. But it is difficult to change an innovation culture in an industry that is fascinated with functional enrichment.

The solution to cost-saving lies in a series of issues that the automotive industry must tackle simultaneously: The use of new and more cost-efficient materials needs to be explored in order to cut material and processing costs. Flexible manufacturing concepts will enable utilization of assembly plants to be improved. Future software will have to work in several models. Intelligently devised bundles of optional extras can reduce the number of possible configurations and eliminate expensive complexity from manufacturing processes.

At the same time, development costs must be lowered. All big automotive companies have launched R&D offshoring initiatives to lower engineering costs and help fuel localized development. Module approaches will reduce R&D costs per unit and enable companies to cope with a larger variety and shorter cycles of models. New design and test-bed software will also help lower the real-world costs of developing automotive components. These are just a few examples of the many initiatives needed to keep cars affordable for the broad public. Cost innovations and lower R&D costs will play a crucial role for the future growth of automotive companies and for the industry as a whole.

### Cost pressure on innovations



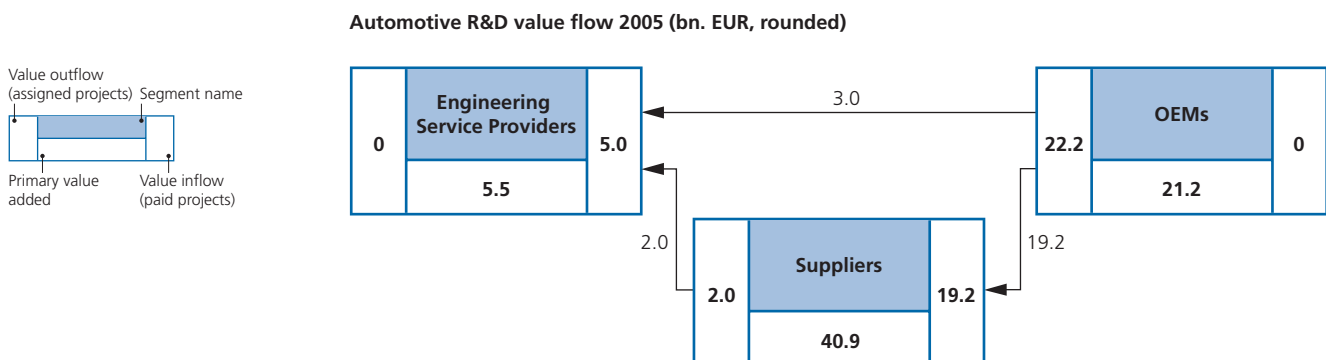
## Basic figures on R&D

“Car Innovation 2015” has thoroughly analyzed the economics of technological innovations in the automotive industry. The figures are based on the financial data of 14 OEMs and 107 selected suppliers, covering about 90 percent of the automotive industry’s turnover worldwide. The 100 largest suppliers account for 75 percent of the total R&D expenditures of the supplier industry.

Between 2001 and 2005, the automotive industry showed a compound annual growth rate of 3.5 percent for OEMs and of 5.7 percent for suppliers (exchange rate fluctuations eliminated). During that time, R&D spending rose by 4.4 percent at OEMs and by 5.5 percent at suppliers, reflecting an increase in R&D outsourcing by OEMs. In 2005, the industry spent EUR 67.6 billion on R&D. By percentage of revenue, the figure was 4.3 percent for suppliers and 4.0 percent for OEMs. 60.5 percent of all R&D was done by suppliers, 31.4 percent by OEMs and 8.1 percent by engineering service providers.

The highest OEM R&D spending per car produced between 2001 and 2005 was by BMW, DaimlerChrysler and Honda. The lowest was by Suzuki, Renault-Nissan and Hyundai. Top spender BMW (EUR 1,796 per car) spent 15 times more than Hyundai (EUR 120 per car). The average was EUR 783.

### Suppliers spend twice as much on R&D as OEMs



## Example: The chances of low-cost designs

In 2015, about ten percent of all automobiles in Europe, China and India will be low-cost cars with sales prices between EUR 3,000 and EUR 7,000. Naturally, the segment is under enormous cost pressure and promises only small profits. However, most OEMs will want to have a low-cost design in their portfolio to serve as an “entry model,” and all big companies are working on low-cost models. R&D in an all-new low-cost model will probably never pay in terms of regained sales profits – but it holds tremendous promise for OEMs: To develop revolutionary materials, modules and processes that radically lower costs. Once in a mature stage, future low-cost techniques will help revolutionize other models, too. Low-cost cars could have new features such as:

- Reduced metal content to save on raw-material costs
- Foamed lightweight structures
- Low-cost module design
- Integrated small-engine power-train concepts (i.e. like motor scooters)
- Coated polymer windows
- Reduced assembly needs
- Centralized car electronics and simplified wiring

## Example: Innovate your assembly concept

Worldwide, the automotive industry is plagued by overcapacities. The inflexible output of the car manufacturer's capital-intensive assembly lines creates the need to sell a more or less fixed number of models each year. However, assembly represents only 12 percent of total vehicle costs for development and production, and one third of the OEM's contribution to it. The current pressure to sell certain models at huge discounts is largely homemade. A more flexible vehicle assembly concept could change this situation fundamentally.

- Reduce complexity to gain flexibility: An increasing number of models with more and more production variants are the driving forces of complexity and costs. A Volkswagen Golf has more than 10<sup>23</sup> possible configurations compared with only 1,740 for a Toyota Corolla. Reducing the number of variants will help increase the number of models produced in one plant, making the system more flexible.
- Outsource assembly peaks: Currently, more than 99 percent of assembly value creation is in the hands of manufacturers. Outsourcing niche models to specialized suppliers (for example Karmann, Magna Steyr, Pininfarina, Valmet) would enable OEMs to adapt more smoothly to fluctuations in demand.

## Implementation: Devise R&D activities to meet the cost agenda

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### Improvement of R&D economics

Within the next ten years, the automotive industry will spend EUR 800 billion on innovations. A close look at the effectiveness and efficiency of the innovation portfolio is needed.

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There are two ways to enliven the automotive industry's cost imperative in R&D: develop technologies that make cars affordable and slash the rising costs of R&D itself.

Encourage cost innovations: Developing new and exciting functions is still the dream of any car engineer. Doing the same things more cost-efficiently is not, and probably will never be.

- Add regular screening of new materials to the R&D program to find materials that can be bought or processed at lower costs
- Introduce an incentive program to recognize extraordinary endeavors that lower costs
- Set cost reduction targets at 30 percent to find completely new ways of fulfilling the function of the module
- Broaden engineering scope, including components that lie up- or downstream of a company's own value chain

Bring down innovation costs: An average of five percent of total vehicle costs are spent on R&D. Due to cars' increasing technology and complexity, R&D costs tend to be about 4.5 percent per year. In order to at least stabilize R&D costs per unit, all R&D cost levers have to be combined:

- 40 percent of all R&D spending is on products that do not yield a sufficient return. Rigorous screening and quality management can stop futile projects sooner.
- R&D offshoring and outsourcing can be applied to ten to 15 percent of the total automotive R&D budget in the long term. Savings of ten to 50 percent are possible.
- New possibilities for virtual tests will help keep rising test costs under control.
- The bookshelf approach for modules will shorten development cycles for new models and considerably lower development costs per module.