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DIFFICULTIES WITH INTRODUCING RADICAL ECO-INNOVATION IN THE CAR INDUSTRY

In this article, some factors hampering the introduction of radical eco-innovation in the car industry are discussed. These difficulties include transaction costs, organisational structure, profability issues, interest groups, large changes required in the logistic chain, the life-cycle of the car and financial markets. Arguments are provided that the government should stimulate eco-efficiency.

INTRODUCTION

One of the challenges in achieving sustainable transport and sustainable development is reducing the use of natural resources and non-renewable energy resources, as well as emission of pollutants, in order to guarantee mobility for future generations. The car is one of the most important means of individual transport, and it is unlikely that the demand for cars will decline in the near future. Without decrease in demand, the only solution to achieve sustainable transport seems to be radical eco-innovation ("the level of emissions and resource use per unit of production (Keijzers, 2003, 37)"). Otherwise, there may be a lack of energy resources for car use, negatively influencing economic performance, while the environmental effects of energy use may negatively influence quality of life and economic activity. In this article, some factors hampering the introduction of radical eco-innovation in the car industry are discussed.

CHALLENGES IN ACHIEVING ECO-INNOVATION

Although step-by-step improvements of internal combustion have significantly reduced fuel consumption, these improvements still allowed the use of steel as the most important material for car bodies, because hydrocarbon fuels have high energy content (Orsato, 2004). Most innovations

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are based on acceptation of the internal combustion engines and steel as basis of the car body as fundaments in car production (Nieuwenhuis and Wells, 1997). In this context, when hybrid cars become very popular, this may lead to significant environmental gains, but also lengthen the life-cycle of the traditional concenpt of a car (Orsato, 2004, 286), in turn slowing down the introduction of new car models requiring less inputs for production. In such a case, innovation and changes in the production process is likely to be incremental.

As Sharma and Starik state, "technological incrementalism avoids questioning the principles embedded in specific technological applications and, by extension, does not question the fundamentals of science guiding industrialism (2004, 14)." Furthermore, it may take quite some time before the technological innovation leads to a significant improvement in productivity or decline in resource intensity of production. There are transaction costs related to the diffusion of new knowledge, while a change in one part of the supply chain may require changes in other parts of the supply chain. A good example is the development of Information Technology, which has its roots in the 1970s. When new technology develops, people first must learn how to use it (education) while firms must find an application for it. The high transaction costs of organisational change related to a change in production technology also hamper the diffusion of such technology.

If we date the emergency of the new technological paradigm to the mid-1970s, and its consolidation to the 1990s, it appears that society as a whole, business firms, institutions, organizations, and people, hardly had time to process technological change and decide on its uses. As a result, the new techno-economic system did not characterize entire national economies in the 1970s and 1980s, and could not be reflected in such synthetic, aggregate measures as the productivity growths rate for the whole economy (Castells, 1996, 74).

Changes in the car design are hampered by the huge consequences it would have for the whole supply chain, embracing a large number of participants with large economic interest (Orsato, 2004, 287). A car consists of 10,000 to 15,000 components, provided by a large number of producers (Nieuwenhuis, 1998). Orsato argues that as these producers are often interdependent and need more time to adjust to changes in the production process, as a change in one component in the supply chain influences the functioning of other parts of the supply chain. Furthermore, the fixed costs of designing a certain type of car are very high in terms of money. Designing a new car may take 5 years, while the model may be facelifted several times during the next 15 years (Wittenberg, 1992). Thus, the long life cycle of a car rather stimulates innovations in the context of the existing fundaments than a radical change in production technology. Furthermore, there are large barriers to entry in the car industry due to economies of scale, but also access to supplier networks. As a result, competitors with innovative ideas are unlikely to appear on the market, reducing incentive for the introduction of innovations by the existing companies (Ernst, 1994; mentioned in Castells, 1996). For these reasons, strategic alliances with other car producers and developing producer and supplier networks are crucial in order to remain up-to-date, and to share costs in new projects (Castells, 1996). Thus, co-operation between large producers, supported by governments, may be a stimulus for more radical technological change.
Research carried out by the Dutch Ministry of Environment (2001; see Keijzers, 2003, 100) identifies some other factors hampering business to implement change into the direction of environmental sustainability:

- Short time horizons used in calculating the expected profitability of an investment project, leaving out potential long-term economic and environmental benefits, which may positively influence the functioning of the firm.

- Firms tend to focus on making their own production-processes more environmentally sound. However, hardly any effort is undertaken to improve eco-efficiency in the whole supply-chain, an issue which is important in the context of increased use of outsourcing.
- Eco-efficiency is often not in the core interest of the firms' management structures.
- There appears to be a lack of knowledge on important stakeholders promoting environmentally-sound production technologies (e.g. NGOs, consumer organisations, pension funds, labour union).
- A question remains whether new technology threatens the position of managers of the company. When radical change would threaten the position of these managers, they are likely to resist such changes (Marglin, 1974).

Keijzers (2003, 107, 113, 129-130) conducted an empirical study concerning the importance of environmental and sustainability issues among the following companies: Heineken, Coca Cola, Suikerunie, Nutreco, Van Melle (food and beverages), AkzoNobel, DSM (chemicals), Ytong (building materials), ING-bank, Rabobank (Banks), Nuon (energy). Outcomes of this study may also be relevant for the car industry. Although the importance of environmental and sustainability issues is recognised[1], the following obstacles were observed:

- It is difficult to incorporate environmental quality issues in day-to-day organisational routines.
- An organisation structure with a relatively large degree of autonomy of individual units creates difficulties in introducing policies supporting environmentally-sound production. This is caused by different perceptions, different interpretation of facts as well as difficulties in establishing who is responsible for what.
- Care for the brand name may lead to improvement of environmental management, in particular when health risks, safety and environmental hazards are involved. This may be of importance for food and beverage industry as well as building materials and chemicals. A question remains whether such care really leads to a large improvement of environmental quality. For example, safety concerns of consumers can lead to demand for larger cars which may leadsto increased use of materials and fuel, as well as increased pollution levels.

Orsato argues that radical technological change is required in the context of incremental institutional change. One of the reasons for incrementalism is that democratic processes require stakeholder involvement, which is time consuming and most of the time requires compromises. Furthermore, development of institutional arrangements dealing with the social and economic consequences of radical technological change is required. However, when the problem of access to energy becomes more pressing, a question is whether incremental institutional change is enough to stimulate radical technological change, taking into consideration that introduction and diffusion of new technologies is time consuming and effects become only clear after a few decades. Thus, when society wants to prevent an energy crisis in a couple of decades, now a process of stimulating fundamental changes in production technologies should be initiated. Whether society manages, de-

[1] As Orsato argues, while car producers may claim to care about the environment, which in reality often means that "[t]hey communicate their intention to protect the natural environment mainly through the publication of corporate environmental reports, open speeches and generic media releases (2004, 277)." ... "[c]armakers have used the subtleties involved in the trade-offs between types and sources of pollutants, as well as competing goals between emissions and safety standards, to protect their interests and to negotiate regulations that would not increase costs or hinder the overall viability of their business. The dispute involving the auto and oil industries and the European Commission is a didactic case of such behaviour (2004, 280)."

pends on the adaptive efficiency of the system and whether we foresee problems, believe they are problems, anticipate, and react in proper time.

However, radical technological change fits in the technocentric paradigm, where it is assumed that technological progress can solve environmental problems, and does not require reduction in production and consumption (Gladwin et al., 1995). It does not question the cause of many problems itself – car possession and car use. It is not only people's mental models that stimulate increasing car possession and car use, but also the interests of different stakeholders. One important stakeholder in supporting the car industry, which often has a much lower profitability rate than other sectors (Orsato, 2004, 292), is the financial sector looking for large investment opportunities. The car industry is attractive as the transaction costs of investing in many small projects may be relatively high, and make it more difficult to withdraw large sums in a short time, negatively influencing liquidity. As Goulding argues:

As consolidation of investment funds continues, it is more and more likely that they will invest in the auto industry – because they have to do. Liquidity is the major issue. Big investment houses have to invest funds greater in value than the largest automaker. Active portfolio management means taking a limited number of big beats. If they want to take a significant shareholding in a company, it has to be a very big one. And there are few bigger than the auto companies (Goulding, 1999, 21).

HOW TO STIMULATE ECO-EFFICIENCY

As there are many barriers in increasing eco-efficiency in the car industry, there may be an important role for national governments. An example may be emission standards. When introducing such standards, it is important that government policy plans are credible, as companies may anticipate these standards and undertake measures to prepare for the achievement of these expected standards. Furthermore, stakeholder involvement in risk assessment, e.g. by consumer organisations and financial institutions, may strengthen incentives for complying with the new policy (Keijzers, 2003, 34-46).

Under the condition of credibility of monitoring, evaluating and enforcing new standards, it may be effective to let the enterprise choose the methods of achieving the standards. It is not clear in advance which methods will be chosen or survive, but acceptation is likely to increase (Jennings and Zandbergen, 1995). Jennings and Zandbergen argue that mimicry is an important factor in eco-innovation. Suppose recycling is introduced by some companies because of environmental awareness or a strategy of developing a competitive advantage, and this leads to cost-saving. In this case recycling may become an industry standard being "copied" by competitors. Mimicry lowers transaction costs as is the case with introducing environmental marketing as a reaction to the actions of competitors. As it is more difficult to change mental models, norms and values in a short time, "[m]imicry is more likely ... to influence organizations in a field to adopt concepts and practices related to ecological sustainability (Jennings and Zandbergen, 1995, 1034)." Thus, when people and organisations follow the sustainable behaviour of a salient stakeholder, they do not have to understand the issue of sustainable development and see the need for it. However, without such awareness, mimicry may also lead to copying unsustainable production and consumption patterns. As Jennings and Zandbergen argue, in reality it may be difficult to distinguish between mimicry and the aim of creating a competitive advantage as the reason for eco-innovation, in particular when information is diffused in networks of companies. However, when companies become aware of the cost-saving

opportunities by increasing eco-efficiency, this may increase awareness that the environment and its quality is a crucial determinant of economic growth and development.

While eco-efficiency may be needed to achieve environmental sustainability and support sustainable transport in the future, radical technological change may reduce the demand for e.g. steel. This may have large influence of business and employment, for which institutional arrangements are needed in order to dampen the negative social and economic effects (see Orsato, 2004). A problem is that increasing energy efficiency in the car industry can lead to an increase in car possession, as not only the cost of production may decrease, but also the direct costs of fuel related to driving. As a result, people may drive more often and longer distances, while the demand for public transport may decline. In total energy use and related environmental problems may be reduced when the reduction due to increased energy efficiency exceeds the increase in energy use due to the possible increase in demand for cars and the related car use. However, when more cars appear on the roads, it is likely that problems with traffic jams will increase. For this reason, eco-innovation should be accompanied by environmentally-sound development of alternative modes of transport.

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TRUDNOŚCI Z WPROWADZENIEM RADYKALNEJ EKO-INNOWACJI W PRZEMYŚLE SAMOCHODOWYM

W niniejszym artykule zostały zaprezentowane niektóre czynniki utrudniające wprowadzenie radykalnej eko-innowacji w przemyśle samochodowym. Te trudności to: koszty transakcji, struktura organizacyjna, opłacalność, grupy interesu, duże zmiany wymagane przez łańcuch logistyczny, cykl życia pojazdu oraz rynki finansowe. Istnieją argumenty za tym, aby eko-wydajność była stymulowana przez rząd.

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