Strategic Management for the Realignment of Risk Determination of the Supply Chain in Electric Car Production

Andreas Britsche
Milan Fekete

Keywords: Electro mobility; Supply chain; Supply; Environmental and demand risks

Abstract: Automobile mobility has been following a new path for years with the electrification of drive-through battery energy and will replace fossil drives in the foreseeable future. Restructuring the existing processes to implement the technical requirements is a challenge for the established OEMs, who must establish new value chains in addition to the existing ones. The established OEMs are thus challenged to configure a management system in their strategic planning that meets the future requirements and allows them to remain competitive. Ultimately, however, the customers are the most important factor, as all planning and degrees of fulfillment are oriented towards them. The key question is thus: How can OEMs strategically align their value chains, taking all factors into account so that they are considered resilient and robust? As a factor of the possibilities of strategic alignment of value chains, the EU project ‘GAIA-X’, which is currently being developed, is considered in this paper.

1. INTRODUCTION

The automotive industry has been in the process of completing the transition from a fossil-dominated drive system to alternative drive systems for about ten years. In the process, a current core solution has established itself in the form of the battery-supported electric drive, which is used by both OEMs and pure-electric players (cf. vom Hemdt, 2019, p. 4). However, even after ten years, OEMs in particular still face considerable problems in designing their value chains in such a way that they can be determined as fully resilient (cf. Falck/Koenen, 2019, p. 3). This makes existing value chain systems more vulnerable to risks from a wide range of areas that affect these chains. OEMs must aim to make the entire value chain more resilient and better protect themselves against risks. To achieve this, however, the companies must have a transparent knowledge of the entire value chain so that there is also management within the chain, its interfaces and the perceivable problem areas that make these factors more robust (cf. EY, 2019, p. 29).

A fundamental issue for the OEMs lies in the areas of competence that are revealed by a restructuring of the automobile in the energy carrier component battery and the differently structured powertrain. These components are not considered core competences of the OEMs, which have so far relied on combustion technology but are now forced by external pressure from society, politics and newly developing or already established competition in the form of pure-electric players to follow the market development.

However, a focus on electromobility requires new conditions in the value chain, which is structured differently than was previously the case with combustion engine technology. This new

1 Comenius University in Bratislava, Department of Strategy and Entrepreneurship, Faculty of Management, Odbojárov 10, 820 05 Bratislava, Slovak Republic
2 Comenius University in Bratislava, Department of Strategy and Entrepreneurship, Faculty of Management, Odbojárov 10, 820 05 Bratislava, Slovak Republic
structure, with all upstream and downstream areas, is presented in the following diagram. The elaboration of strategic management in this article focuses on the areas A1; a1 - B2; b2 - C3; c3 - 7 and the regulatory framework. They define themselves in problem determination as the main factors for the OEMs in the area of readjustment and adjustment for risk management.

**Figure 1.** Complete supply chain of the electric car industry  
*Source: German Federal Ministry for Economic Affairs and Energy, 2016, p. 8*

**Figure 2.** Strategic planning as a component of overall strategic management and the existing influencing factors and variables.  
*Source: Ansoff et al., 1076, p. 2; in: Welge et al., 2017, p. 14*

Although a repositioning has already taken place in parts and numerous models have already entered the supply market, numerous international, intranational and national changes and demands have brought about movements in the transformation to electric automobility that particularly affect the OEMs and generate a need for action. Therefore:

“Economic, technological and demographic change is predictable and transforms the environment of automotive companies. Change can open opportunities, but also poses strategic
risks - especially economic, technological and demographic, as well as political and customer-related risks. Automotive manufacturers and suppliers must therefore look for strategies to best deal with these environmental changes.” (Proff/Proff, 2013, p. 63).

The complexity and the existing possibilities of interactions were mapped by Ansoff et al. as early as 1976 in a clear model that also applies to the automotive industry.

Because the automotive industry is of great importance to many national economies (cf. Puls/Fritsch, 2020, p. 12f.), it is important to create a manageable solution for the whole European OEMs.

2. SUPPLY RISKS

The requirements of new suppliers and component manufacturers and suppliers go hand in hand with the changeover of energy generation in the automobile through the battery and a new powertrain based on electric energy generation.

However, the core technology of electric automobility is almost unanimously seen in battery technology, which requires other raw material components and need not be seen as the core competence of OEMs (cf. Kampker et al., 2018, p. 48). This is where battery manufacturers are required, not necessarily part of the corporate structure, but to act as partners.

In the meantime, some OEMs have started to include their production in the group structure, which simplifies the adjustment of technical requirements (size, compatibility, performance requirements, etc.). The increasing captive demand of the markets in China, Japan and South Korea will reduce the willingness to pay high export rates in the event of rising demand, or possibly cause battery prices to rise for European OEMs (customs duties, levies, etc.). The current supplier structure internationally is as follows.

![Figure 3. Distribution of battery producers by company and region](image_url)

*Source: Vom Hemdt, 2019, p. 5*
Therefore, planning is geared towards own battery production, which requires an additional strategy in the procurement of raw materials. This is the real problem area of battery technology - the availability of necessary raw materials needed for manufacturing. Lithium and cobalt are the raw materials with the highest risks for availability for production. In addition, with the extraction of raw materials in the Congo as the largest producer of cobalt, the extraction methods are considered politically critical (cf. Falk/Koenen, 2019, p. 17). This collides with the political requirements through compliance with humane working environments and sustainability in connection with the Supply Chain Act.

However, forecasts for the availability of primary lithium and cobalt vary widely (cf. Leifker et al., 2018, p. 27f./Ames/Schurath, 2018, p. 2). Some researchers believe that the quantities for the automotive industry are sufficient to cover a long-term demand (cf. Ames/Schurath, 2018, p. 2). This includes the consideration that by increasing recycling, the amount of primary lithium and cobalt can be reduced in the future (cf. Morche et al., 2018, p. 253). Other researchers are more skeptical about resource availability, which is also related to the further development of the needs of other electrical industries. A lot of alternative industries also have an increasing demand for these two raw materials, so the overall calculation should not only be oriented towards the automotive industry. In the case of cobalt, the use is even broader, so that even more branches of industry are competing for the raw material.

The extraction of these two important raw materials as elementary components for battery technology is globally limited to a few regions (cf. Ames/Schurath, 2018, p. 3).

The distribution of lithium reserves in tonnes among the main nations with deposits is as follows:

- Argentina: 9,000,000
- Bolivia: 9,000,000
- Chile: 7,500,000
- China: 7,000,000
- Australia: 2,000,000
- Brazil: 200,000
- Zimbabwe: 100,000
- Portugal: 60,000
- Germany: 60,000

Subtotal: 34,920,000.
Worldwide: 47,020,000.3

Since in many of these countries the extraction conditions are considered inhumane and highly dangerous (cf. exaggerated Leifker et al., 2018/Ames/Schurath, 2018), the European OEMs come into serious conflict through the state legislation on supply chain sustainability, which already takes effect in many states. Accordingly, manufacturers are forced to remove such extraction companies or, if necessary, entire nations from their resource portfolios because they do not comply with the legal basis.

For other nations, the dependence on supply is very strong (e.g. China), so competition arises because China has a high demand, which reduces exports (cf. Leifker et al., 2018, p. 10).

3. ENVIRONMENTAL RISKS

The links between new sectors and the automotive industry must also be included in strategic management, as the new technology requires a different energy supply network than was the case with fossil fuels in the form of petrol station operators.

Electricity grids in Germany are considered to be very well developed and secure. However, with the expansion of electric vehicles, different electricity consumption will emerge, which will place a different burden on the existing electricity grids. The need for transformer stations, larger load capacities of the grids and expanded security models for the grids as critical infrastructures will increase and this development must be supported by the energy providers in the power supply sector (cf. Schill, 2010, pp. 155f.).

Furthermore, grid operators will also be challenged here if they do not act as providers in the same way. The changeover from the previous load capacities will require an upgrade of the grids if electric vehicles continue to increase, so that overloads and outages can be counteracted. For many parts of the country, this will mean a large investment in existing infrastructure that will need to be made on time.

One of the most important infrastructure measures must be seen as the expansion of public charging stations, which has increased in recent years but is still far from user-friendly coverage that raises mobility with electric vehicles to the same level as has happened with the long-established structures of the filling station networks (cf. exaggerated BMWi, 2016).

For the OEMs and the pure-electric players as well, this poses a fundamental problem, as expansive production is only effective if the infrastructure for charging safety also exists. This also determines to a large extent the willingness of customers to switch to an electric car. Reluctance here is not only due to the range technically possible in the vehicle, but also the mobility determination, which is oriented towards these charging possibilities. (See the statement by the head of the VDA Hildegard Müller: https://www.sueddeutsche.de/service/jahreswechsel-autobranche-sieht-hochlauf-der-elektromobilitaet-gefaehrdet-dpa.urn-newsml-dpa-com-20090101-211227-99-511759).

Impetuses and interventions that repeatedly impose adjustment requirements on the entire industry must be given special attention, as compliance violations not only generate monetary consequences but also mean a loss of reputation.

The most serious intervention by the state is the Supply Chain Act, which affects all market sectors, but adds to the problems of building a new and robust value chain during the OEMs’ transformation phase.

In addition, there is another problem point that affects electricity producers and all associated industries - ergo also electromobility. The EEG\(^4\) levy is an external price influence that increases energy prices in the field of electricity and power. Such a price influence can have a negative impact on the demand for electric cars, as it means that the alternative demand is not a positive factor. At the same time, taxation and levies on fossil fuels are being tightened to encourage consumers to adopt an environmentally friendly attitude. As a sign, this is counterproductive, as no decision is understood as an added value and benefit.

For OEMs, such developments have a negative impact on the pricing of their electric cars, as the costs are high in the selling price and any reduction due to an increase in sales is neutralized by energy prices.

\(^{4}\) Renewable Energy Sources Act or EEG (German: Erneuerbare-Energien-Gesetz).
Additional pressure for the OEMs arises from the ambitious climate targets set by politicians, which also have a direct impact on the manufacturing requirements of the OEMs. China and the EU in particular have set up regulations that can be seen as a direct intervention in the manufacturer’s strategy. The Chinese government has set up the regulatory mechanism by means of a binding quota that states that manufacturers with more than 30,000 cars sold per year must make 8-10% of these cars purely electric. Otherwise, there is a threat of import restrictions and other economic restrictions for manufacturers who do not comply with the quota (cf. Falk/Koenen, 2019, p. 9).

“In Europe, the European Commission and the European Parliament have created an effective instrument to influence the composition of vehicle fleets and the model strategy of manufacturers with EU Regulation 443/2009. It gives vehicle manufacturers limits for the average CO2 emissions of newly registered vehicles. If these are not complied with, there is the threat of fines in the billions, which are all the higher the further the target is missed. “ (Falk/Koenen, 2019, p. 9)”

The regulations are definitely an intervention in the distribution strategy of the OEMs - even if they serve the climate goal - and with all the other risk factors they represent a considerable burden, which for the time being should be seen as taking advantage of the pure-electric players and influencing the market.

Nevertheless, to drive demand for electric cars, the government in Germany has introduced purchase premiums. This takes the following form:

“A purchase premium for the acquisition of electric vehicles is intended to accelerate the spread of electric vehicles in the market. It is granted in the amount of 4,000 euros for purely electric vehicles and 3,000 euros for plug-in hybrids and is financed in equal parts by the German government and the industry with 600 million euros until 2019 at the latest. The electrically powered vehicle to be subsidized must have a list price for the base model of less than 60,000 euros.” (BMWi, 2016, p. 7)

To date, however, the measures have failed to provide the push that made the former government’s political goals achievable, and by 2020, approximately 300,000 electric vehicles had been registered (see VDA, 2020, p. 124).

4. DEMAND RISKS

Demand effects show up most clearly in two factors, in that customers compare the price and the quality provided for it. However, price is still a demand restraint in the electric car sector, as the cost of a new purchase is still very high. This is compounded by the fact that the mobility performance is very limited, even though the ranges have improved over the last ten years.

This then reveals another factor of the OEMs’ model breadth to serve the multitude of segments. Pure-electric players already dominate some of the segments (small cars and mid-size cars), so OEMs should consider which segments they want to occupy themselves and with which approach they want to enter into direct competition. Consequently, the demand market needs to be precisely elicited.

For 2019, Deloitte has surveyed international customer buying preferences for six major demand markets, which can be read in the chart below.
A distinction is made here between four customer groups that can be defined for the field of electromobility:

- **Tech-savvy,**
- **Environmentally conscious,**
- **Conservatives and,**
- **Price-conscious customers** (cf. Till/Plötz, 2011, pp. 31f.).

Techies are considered enthusiasts when it comes to new tech trends, but they represent only a small proportion of customers.

The customer group of the environmentally conscious is one of the most important groups, as they are considered the largest group. This includes above all the younger customers who will determine the car market by means of demand in the coming decades and who will dominate environmental awareness even more strongly in the process (cf. among others Proff, 2013/Prill et al, 2018).

Conservatives are the customers who are not yet convinced of the possibilities of the new drive technology and would therefore purchase a hybrid engine as the greatest concession. Here, too, there is a large customer group that can only be persuaded to switch by an equivalent alternative in terms of price and mobility comfort.

Customers who can be determined as price-conscious are focused in this segment on obtaining a low-priced variant that comes close to meeting minimum standards. The price is also based on the accompanying costs and follow-up costs that may arise from the purchase.

In general, it should be noted that regardless of the defined customer characteristics, the issue of efficiency in range and thus flexible mobility will be a decision-making moment. Here, research and development in particular are called upon to expand the possibilities that have existed to date. But it is also necessary to adapt the framework conditions that were outlined around environmental risks, as they are just as decisive for mobility.

One of the main questions that OEMs must ask themselves against this backdrop is the breadth of the model range or a gradual orientation that initially focuses on individual segments that are also in demand by most potential customers in order to establish themselves in the new market and make investments profitable.
5. SOLUTION APPROACHES FOR STRONGER RESILIENCE OF THE VALUE CHAIN

An important approach to improving the design of value chains and their resilience is the planning and development of the GAIA-X project. This project was launched by the German Federal Government in 2019 and its structure represents a digital data infrastructure at the EU level that will facilitate the exchange between various relevant areas of science, industry and politics. It is also planned to expand the participation of market participants beyond the European Union (cf. BMWi, 2019, p. 2). The basic idea behind this approach is to prepare companies and the entire European economy more robustly for exogenous and emergent situations and to keep competitiveness stable (cf. Bernhardt/Steininger, 2021, p. 66). In essence, for a concept like GAIA-X, this means not only providing secure data exchange systems but also filling them with content. For the participants, this approach makes information easier to exchange in a central aspect. Voluntariness is in the foreground, whereby it is emphasized that such a transfer of knowledge generates a high added value nationally or intranationally (cf. BMWi, 2020, p. 3). The basic concept can be seen in the following overview and explains which approach is being pursued with GAIA-X.

![Figure 5. Architecture of the GAIA-X approach at all involved and relevant levels](Source: BMWi, 2020, p. 5)

The GAIA-X project is currently (as of February 2022) still under construction. However, the project will soon become fully functional as a future exchange platform and will be freely accessible to all participants in this information infrastructure. The Federal Ministry for Economic Affairs and Climate Protection formulates the objective that a prototype of GAIA-X with the technical core competences will be made available in September 2022 (cf. BMWi, 2022).

In essence, the companies should be able to feed in their own selected data, information and concepts, which can serve as an informational aid for other companies. At the same time, the data and information exchange also offer providers the opportunity to receive adequate data and

---

5 This statement was formulated at the request of a member of the German Bundestag to the ministry in a reply letter, which was made publicly available as a pdf document.
information from other partners. Through the exchange, those responsible hope for a higher rate of innovation in existing areas and thus an increase in the efficiency of areas relevant to society as a whole. This also includes the area of mobility. However, exchange hubs are defined for the sectors of health, agriculture, housing, electronics, finance and public administration, which are also used on an interdisciplinary basis (cf. BMWi, 2020, p. 6).

In relation to the automotive industry, which has a high economic power across the EU, such an exchange principle will yield several benefits:
• Possibility of EU standardization of parts and components,
• Delimitations of dependencies of international supply chains,
• Increasing market positioning vis-à-vis strong international competitors,
• Coordinated R&D concepts to obtain further European patents,
• Facilitation of raw material procurement through aggregation,
• More stringent compliance with EU legislation in the value chain,
• Provide standardization for the development of new value chains (electric car technology or, in the future, fuel cell technology),
• Specifications for international participants as a market limiting factor for non-EU products,
• Maintaining unique selling propositions through OEM-specific innovations (in-house core services vs. outsourcing to third parties),
• Lower costs by bundling R&D activities in areas that are not relevant to competition,
• Increasing the market acceptance of electric cars,
• Compliance with the EU directive on CO2 emissions,
• Compliance with supply chain regulations in terms of humanity and sustainability.

Research and development are a time-consuming and cost-intensive process that is carried out by all OEMs and pure players in order to have unique selling points over the competition through innovations. The possibility of an EU-wide standardization of standard parts and components in the production of electric cars offers the opportunity to realign the focus of innovation through the GAIA-X approach. This should be used on the part of the EU as political authority in the form of defining standards. One example would be uniform sub-processes for battery technology production as the core of electromobility. A corresponding standardization would result in market effects that support the OEMs in the technological, strategic and resource-based design of the value chain. Since the focus to date has been on building up the respective OEMs’ battery production, a standardization decision in favor of (partial) standards - including the connection and recharging hardware - could accelerate the value chain.

OEMs are forced by legislators in the form of climate targets to establish an electric car value chain, but this involves several problem areas. For example, in addition to climate targets, legal requirements are imposed on raw materials, semi-finished goods and component suppliers in many nations in the form of supply chain laws. The conditions regarding the sustainability and humane working conditions of the extraction of raw materials.

If (partial) battery manufacturing processes were standardized, several conditions on the compliance side could be fulfilled more easily here by pushing ahead with purely European battery production. This reduces dependencies on global suppliers and makes the supply situation more resilient by shortening the supply chain. This also applies to the consideration of raw materials needed for manufacturing. First and foremost, in quantitative terms, are the elements lithium
and cobalt, which are currently the most important core raw materials for battery production and are considered a major problem in the public debate. An overall European solution in this area could curb these problems and simplify the compliance required of OEMs. The basic prerequisite here would be a pan-European mining strategy that considers all relevant legal requirements while providing sufficient raw materials for battery production. With such a large demand market, which also appears to be easier to plan, the raw material suppliers are more willing to fulfill conditions in the interest of the customers (in this case all OEMs with the respective battery manufacturers). A separate mining strategy, as is being pursued by the USA and China geopolitically in various countries, would reduce the EU’s dependence and represent a weighty counterbalance to the developing competitors - especially in Asia. With this aggregated supply of raw materials, the pure raw material dependencies in China regarding lithium would also decrease, which would put the competitive situation internationally on a new footing. The current situation of the share in demand-relevant nations of registered electric models on the international market from the perspective of the German OEMs is as follows in 2020:

<table>
<thead>
<tr>
<th>Market</th>
<th>Number of models</th>
<th>of which Germans</th>
<th>Share Germans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>119</td>
<td>59</td>
<td>50%</td>
</tr>
<tr>
<td>China</td>
<td>390</td>
<td>31</td>
<td>8%</td>
</tr>
<tr>
<td>Germany</td>
<td>106</td>
<td>69</td>
<td>65%</td>
</tr>
<tr>
<td>France</td>
<td>164</td>
<td>68</td>
<td>41%</td>
</tr>
<tr>
<td>Great Britain</td>
<td>106</td>
<td>53</td>
<td>50%</td>
</tr>
<tr>
<td>Japan</td>
<td>44</td>
<td>23</td>
<td>52%</td>
</tr>
<tr>
<td>Canada</td>
<td>53</td>
<td>20</td>
<td>38%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>126</td>
<td>57</td>
<td>45%</td>
</tr>
<tr>
<td>Norway</td>
<td>116</td>
<td>53</td>
<td>46%</td>
</tr>
<tr>
<td>Sweden</td>
<td>115</td>
<td>61</td>
<td>53%</td>
</tr>
<tr>
<td>South Korea</td>
<td>35</td>
<td>14</td>
<td>40%</td>
</tr>
<tr>
<td>USA</td>
<td>49</td>
<td>13</td>
<td>27%</td>
</tr>
</tbody>
</table>

**Figure 6.** Registrations of electric vehicles in various international markets and German shares in absolute figures and percentages

*Source: IHS, Fourin, KBA, Wardsauto; in: VDA, 2020, p. 127*

These comparative figures show the markets that must be considered difficult for German OEMs alone to accept (USA and China). The share of electric vehicles in the product range is high in these two countries and is preferred by local customers. By focusing more on other relevant factors of future mobility, European manufacturers can gain an innovative edge here, which will also have a positive effect on registration and sales figures in difficult markets.

As the focus is concentrated on, for example, body technology in the form of lighter composites, sensor technology, energy efficiency or autonomous driving using AI, European OEMs
can focus innovation efforts on future mobility technologies. The expected lead technologies for future mobility are identified by Kuhnert et al. as follows (Kuhnert et al., 2017):

- **Electrified**: The dominant powertrains will be based on battery technology in the coming years.

- **Autonomous**: Autonomous driving through AI and interactive sensor technology will make driving more comfortable and safer.

- **Shared**: The trend will be that cars do not necessarily have to be owned but are freely available through a sharing system and thus subject to demand.

- **Connected**: The connection of one’s vehicle with the outside world will be established in a similar way to the smartphone. There are communication possibilities on all channels. In addition, there will be interaction with the traffic infrastructure in the form of signals, signs and traffic lights to increase safety.

- **Yearly updated**: Innovation increases are brought up to date through updated infrastructure so that technical digital potentials are installed automatically on a software basis. Hardware components are excluded from this (Cf. Kuhnert et al., 2017, p. 8f).

In addition, existing battery technologies can be expanded in a targeted manner to achieve range efficiency. This would ensure the further development of battery technology, as even marginal improvements to the basic technology represent an increase in efficiency. This would be the responsibility of university research and battery manufacturers within the GAIA-X structures. This would also allow completely new technical concepts to be included in the project by means of a re-normalization and defined as a new standard.

With such a structure of the value chain, the pricing strategies for electric cars could generate a price advantage that does not need to be supported by state financial subsidies. Purchase premiums, tax benefits and insurance subsidies that currently burden the state budget can be reduced and the market can once again be subjected to market forces. The current state support mechanisms to increase the incentive to buy an electric car are as follows:

- “the extension of the already existing ten-year vehicle tax exemption for purely electric vehicles until 31.12.2030,

- a doubling of the federal government’s premiums as a new “innovation premium”,

- Research and development in the field of electromobility and battery cell production,

- the modernization of bus and truck fleets with alternative drives, specifically the promotion of e-buses and their charging infrastructure,

- the procurement of municipal commercial vehicles powered by fuel cells, including the necessary hydrogen infrastructure,

- Fleet exchange programs for social services and craftsmen and

- the expansion of modern and customer-friendly charging infrastructure.” (VDA, 2020, P. 123).

Some of these incentives and support mechanisms linked to private purchases could then be dismantled or phased out in the foreseeable future.

By shaping a uniform, sustainable and humanitarian value chain of battery technology, the acceptance of buyers would additionally increase, as moral, financial and mobility concerns are increasingly reduced. More sales of electric cars therefore also have a pull effect on the expansion of the charging infrastructure and the efforts to achieve the climate targets.
6. STRATEGIC REALIGNMENT OF SUPPLY CHAIN MANAGEMENT

The comprehensive approach to the consideration of strategic management according to Ansoff shows that the inclusion of external parameters and indirect parameters as influencing factors has transformed the planning concept into a defined management function. This is pursued with an integrative approach. All available information from the areas of the value chain is collected, evaluated and forwarded as relevant information to the responsible management areas. This is not to be viewed in isolation but is incorporated into an overall concept as integrative management. The respective influences on the internal areas, the external tangent points (suppliers, service providers, etc.), the indirect influencing factors (technical development, social attitudes) and the political provisions are all considered. Since this comprehensive information base enables each company to adapt its own decisions to the requirements, it is no longer a pure planning concept but a management function. In a continuous process of adaptation and improvement, the factors are explicitly recorded and implemented in the relevant areas of the processes. This implementation presupposes a certain number of modifications to the company’s own existing corporate philosophies and its strategic planning in order to create the flexibility of the company and its processes that can perceive and absorb external relevant factors for the processes. Ansoff formulates five core tasks that are necessary for flexible strategy implementation (cf. Ansoff, 1988, p. 179ff.).

- Development of entrepreneurial capability: Establishment of flat hierarchies and constant direct communication with all relevant actors in the processes.
- Diagnosing general management capability: Determining an existing management culture at the decision-making levels; ability to solve problem factors; involvement of employees and their know-how; functional factors in the company; knowledge stocks, knowledge documentation and knowledge utilization; efficient use of resources in the company.
- Planning strategic posture transformation: By identifying and perceiving relevant factors (internal as well as external), build a management structure that enables adaptation and improvement at relevant points and in processes.
- Assuring coexistence of competitive and entrepreneurial activities: Differentiate between operational goals and strategic goals and then combine them in a further step in order to check, adjust, implement and control operational goals for their implementation based on strategic factors – continuous improvement process.
- Approaches to managing discontinuous change: Preventive approach to change. Communicate change requests to all employees and departments at an early stage. Seek cooperation with employees, identify resistance, create solutions in cooperation, and develop conflict and crisis management internally to absorb internal resistance and resolve it as positively as possible.

These tasks must be redefined and brought to a resilient level, especially in the current situation for OEMs, as a new value chain is emerging with electric automobility. In 2016, the German Federal Ministry for Economic Affairs and Energy emphasized in this regard:

“New technologies and data-based business models are being implemented in globally networked planning and production processes. Electromobility generates competition – new vehicle, component and battery manufacturers are changing global value creation relationships. To remain competitive, market players must optimize the production processes used, make the individual production steps more efficient, and generate synergies in the value chain. In the process, procurement and supply chains are being subdivided and organized in a decentralized manner.” (BMWi, 2016, p. 8).
Internally, this value chain places immense demands on the company itself (new suppliers, new processes, determination of new supply chain uncertainties and risks, new training and development requirements for existing staff). But there are also external demands on the OEMs, which are formed socially, politically/legally and resource-oriented (suppliers).

In the case of electric automobility, however, the requirements go even further beyond these areas. The close traditional link between the automotive industry and fuel producers and distributors is being replaced by a new necessary link. The new ‘fuel’ is electrical energy provided by other suppliers. Since these connections have acted in a disconnected manner, the infrastructural conditions regarding charging infrastructure have not developed congruently with the OEMs. The requirements for an area-wide charging infrastructure still lag far behind the required capacities and indirectly put pressure on the OEMs. The end customer decides with his purchasing behavior whether and when he/she will buy an electric car. Negatively, customers perceive currently too little charging capacity to satisfy their mobility demands. With regard to these aspects, GAIA-X can free up deployed capacities, enable consolidated planning structures and integrate new management strategies.

The following table gives an overview of the potentials that are possible through the implementation of GAIA-X nationally and EU-wide. The parameters selected are based on Ansoff’s strategic management approach and include both internal and external management approaches. Likewise, the process design options and the political, social and technical-economic variables are included so that the interactions of all parameters become clear.

**Figure 7. Parameters of possible positive changes in the automotive industry in Europe through the GAIA-X project**

*Source: Own design, 2022.*
In addition, the factor of Europeanization of the industrial orientation at the OEMs was added, which is necessary to consider the automotive market as an overall European market, which enters into direct competition with the markets in Asia and the U.S. market. The prerequisite is that the individual competing OEMs on the continent are prepared to forego areas of individualization in favor of a pan-European market in order to represent a supply force for the entire international automotive market. However, the self-interests are still very much above the overall interests, as the cases in the diesel scandal have also shown. But there is also the other side in the whole picture, which has made it clear to OEMs that partial cooperation in restructuring the entire supply chain can leverage added value.

“The sharply increasing demands that are emerging with the strategic shift toward electric vehicles and the pervasive digitization in vehicles are fostering collaborations among automotive OEMs that were previously unthinkable to the same extent. BMW, for example, is cooperating with Daimler on car sharing and autonomous driving, but the development of joint platforms for future e-models is also under discussion. There are also plans for Ford and VW to collaborate, including Ford’s future use of Volkswagen’s MEB electric modular system.” (Karle, 2020, p. 6f.).

Implementation with GAIA-X would have synergistic effects on sales in competitor markets and at the same time would provide an incentive for international raw material suppliers, and accessory and semi-finished goods manufacturers to cooperate with European OEMs.

This basic consideration of integration into European strategy management is based on the real fear of European OEMs losing important shares of the market for electric cars to Asian and American (USA) competitors (cf. Puls/Fritsch, 2020, p. 5). Here, above all, the availability of batteries and the raw materials required for them represent one of the most important parameters. Without the battery as an energy source and storage medium in sufficient quantities, electrification of automotive technology is unthinkable and requires a clear strategy in the design of supply chains and their processes (cf. Kleine-Möllhoff et al., 2012, p. 4/Hoberg et al., 2010, p. 51).

Ansoff’s approach to strategic management applied to the implementation of GAIA-X in the European automotive industry shows opportunities to facilitate the transformation of value chains. The neuralgic points of reengineering with existing and new suppliers, the political influencing factors and the orientation of a stronger intranationalization of market conditions can be positively influenced here, especially with GAIA-X. However, all parameters depend on the further implementations and cooperation of the relevant actors and how the project will continue to establish itself.

All factors, however, are strong in their impact on the international competitive situation with Asian and U.S. markets as pioneering. The national suppliers, taken individually, would suffer to varying degrees from the new competition in their further development. Synergy effects through GAIA-X can mitigate these competitive features.

---

6 Within the clarification around the diesel exhaust values it was determined that the German OEMs agreed on a smaller size of the ADBlue tanks, which are necessary for the cleaning of exhaust gases. This became important because a larger ADBlue tank directly influence the size of the regular fuel tank. A smaller fuel tank reduces the range of the vehicles. The Daimler AG obtained immunity from prosecution within the leniency program, and VW AG and BMW AG had to pay 502 million and 373 million EUR fines, respectively for cartel-like agreements (Efler, 2021; Source: www.merkur.de/wirtschaft/adblue-eu-strafe-volkswagen-bmw-daimler-abgas-absprache-diesel-skandal-kartell-tank-bruessel-zr-90849661.amp.html.)
7. CONCLUSION

The automotive market is transforming itself almost completely through the changeover to electromobility and is confronted with different problem situations in the process. In order to achieve high efficiency in the transformation here, knowledge must be collected, analyzed and minimized, especially in the risk area. These risk factors extend across the most diverse areas of the value chain and must be considered in their interactions. This requires strategic management in all relevant areas. To make this possible, the holistic approach of Ansoff et al. was selected as the theoretical basis for modeling, since in this approach, in addition to the direct tangents, indirect reference moments in the form of customer expectations and likewise political influences are also included.

It was recognized that the technical component has a lesser influence than the compliance requirements and supplier setups for the drive form based on battery technology.

To facilitate the transition of the entire value chain for OEMs across Europe while keeping all relevant areas in view, the GAIA-X project was identified as an effective means. This project establishes new competitive opportunities in the face of increasing international market pressure.

For the automotive OEMs with high importance to the European economies, the possibilities of participating in GAIA-X are to be evaluated as very far-reaching. Which areas with which parameters are considered to have a positive impact on the automotive sector on the continent have been summarized within a parameter table and provide an overview of the potential activities that allow suppliers to reposition themselves.

An important factor in the differentiation of European OEMs lies in standardizations that must also be recognized internationally if international suppliers are to continue to serve the European market. The EU is an important political factor here, as all national OEMs are involved in it. By exchanging information via GAIA-X, the industry can more quickly adopt standardizations and implement them in its products.

When it comes to establishing new supplier relationships, the opportunities can also be considered high if the possibilities offered by GAIA-X are used. These are also based on the standardization approaches, but also extend to the OEMs’ other unique selling points, which enable national and intranational competition on a wide scale. Body engineering, IT and AI in automobiles, services and other technical capabilities will continue to maintain and increase the individuality of manufacturers. This is equally true for competitive opportunities with the expansive markets of China and the U.S., as well as Japan and South Korea.

The battery component can gain an important push toward strong European manufacturing if battery components are standardized and generally used uniformly by all manufacturers. The extent to which Europe can build up its production and break away from international dependencies will also depend on the possibilities for sourcing raw materials. One basic idea here is to take the initiative in participating in raw material production in the relevant countries. The incentive must be created here by offering its offers of support in the infrastructural area (traffic, education, IT, etc.), which also serve sustainability. In this way, one can enter into direct competition with American and, above all, Chinese efforts to influence the producing countries. The market power of Europe as an importer due to a large demand represents important incentive moments here.
However, the recognized possibilities are based on the willingness of all participants to the structures of the GAIA-X project, which can be described as high so far. However, further expansion at this level is urgently required.

ACKNOWLEDGMENT

This work was supported by the Faculty of Management, Comenius University in Bratislava, Slovakia.

REFERENCES


Kleinert, I. (2016). *Structural change in the automotive industry: change in the innovation systems of the German automotive industry through electromobility*. Dissertation approved by the Department of Social Sciences of the Technical University of Kaiserslautern for the award of the academic degree Doctor of Philosophy (Dr. phil.).


Vom Hemdt, A. (2019). *Battery cell production and value chain development in Germany. Critical factors for successful battery cell production in Germany*. Aachen: PEM/RWTH.
