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Electric sports cars and their impact on the component sourcing process

Abstract

The trend towards electric mobility is ongoing, and it possesses the potential to reshape the future of international motor vehicle production. Furthermore, it will replace conventional driving technologies and have a disruptive impact on the automobile industry market and the private consumer. By its transformational character, the electric mobility trend is already impacting on the nature and form of the component sourcing process between the original equipment manufacturer (OEM) and its suppliers. Hence, the trend has brought in completely new industry participants, relationships and a reconfiguration of how goods and supplies are being sourced. Within this transformational environment, the incumbent automobile manufacturers need to rethink and redefine their business and sourcing strategy (in order to hold their market position within this rapidly emerging industrial and communication technology (ICT)-industrial framework). This paper explores how the sourcing process is changing with respect to competitive advantage, required capabilities and emerging opportunism. The changed supply conditions are requiring new sourcing strategies to be implemented. We make a contribution towards transactional and resources based theory by exploring asset and operational capability building within the context of the automotive sourcing process. Theoretically this paper suggests that sourcing is a key operational capability to build strategic assets and improve transactional efficiency. It is a critical ingredient in the automotive supply chain of the incumbents transforming itself. Furthermore, for our case firm, aligning its complete sourcing strategy to its business strategy will be crucial in order to have sufficient operational capability. A capability, that it will need not only to compete, but also to survive, the accelerating threat of new entrants moving into the electric sports car marketspace.

Electric sports cars and their impact on the component sourcing process

1.0 Introduction

The motor vehicle of 2025 is expected to look and function quite different than it does today. It is suggested that cars will become a computer on wheels generating vast amounts of valuable data. The future motor vehicle firm will need to have a "smart city*"* infrastructure (whereby information and communication technologies (ICTs) are integrated into urban infrastructures (Wamba, 2017)) in place if it is to be able to process, analyse, and strategically learn from the data it collects. Forecasts estimate a global market of 250 million connected cars on the road within the next eight years (Gissler, 2015). Consulting firm McKinsey estimates that connected car data and the new business models that emerge could be worth $1.5 trillion a year by 2030 (Gao et al., 2016).

A connected car denotes: "a vehicle equipped with Internet access, and usually also with a wireless local area network" (Swan, 2015, p. 3). There are a number of disruptive market and technological trends presumed to shape the future of cars, from a growing focus on service innovation to new patterns of ownership and the emergence of disruptive technologies (i.e. "big data" (BD) (Zhan et al., 2017) and the "internet of things" (IoT)) (Stawski, 2015).

Whilst the developments in IoT and big data has created several market opportunities for incumbents (Müller and Jensen, 2017;), it is primarily the new entrants, such as Tesla which have seized the strategic initiative and built first mover advantage through their distinctive service innovation competences (Storey et al., 2016).

Although much has been written about the technological challenges of electric vehicles and the rise of new entrants such as Tesla to challenge the dominance of the sports

car manufacturer's very little work to data has explored the business-to-business (B2B) dimensions. The focus has been with the business-to-consumers (B2C) market.

The scope of this paper is therefore to enhance the existing literature and fill this gap, by building, testing and advancing a theoretical framework with case study data. The work will focus upon the strategic alignment of the sourcing process with organizational strategy; in order to capitalise on the opportunities being created by rapid technological change. This framework is theoretically underpinned by transaction cost economics and the resource based view. We combine these two theories and extend them to highlight the strategic assets and transaction efficiency that can be contributed by the sourcing process, to firm competitive advantage. The electric sports car provides a context for the authors to advance operational capabilities theory. We aim to solve a theoretical puzzle: Can the sports car firm build sufficient operational capability through outsourcing, to deal with strategic turbulence being caused, by the need of the firm to adjust its organizational strategy to the electric mobility trend? .

In terms of the electric powertrain components, the trend towards electric vehicles has led to the need for a completely new set of car components. For which the resource setting and potential sourcing strategy needs to be evaluated and defined for the first time. The paper will focus on the three components: i. "e-machine"; ii. the "pulse converter" and iii. the "battery". As these are the most important components in terms of economic and operational value to the electric vehicle powertrain.

This paper is organized as follows. In the next section we consider the main bodies of sourcing theory and propose an adapted version of the McIvor framework. The methods for testing and advancing this framework are then outlined in section 3. Case study results will be

presented in section 4 and finally in section 5 the conclusions and implications for further research are presented.

2.0 Sourcing Theory

By viewing the firm as a bundle of resources and capabilities that are employed in specific ways to create competitive advantage for an organization (Barney, 1991), the resource based view (RBV) is crucial to understanding the discipline of outsourcing. Hence, superior relative performance of a specific organization explains why certain activities are internalized or outsourced. The study of outsourcing is rooted in the drive for greater efficiencies and cost reductions. For most organizations, outsourcing is seen as a powerful tool to reduce costs and improve performance. There are two influential theories in the study of outsourcing; this is "RBV" and "transaction costs economics" (TCE) (McIvor, 2009, pp. 45-46).

Most of the literature is either focused on TCE or the RBV approach in explaining outsourcing decision (Vivek et al., 2008, Coates and McDermott, 2002, Grover and Malhotra, 2003, Hayes et al., 2005, Holcomb and Hitt, 2007, Jiang et al., 2007, Vastag, 2000, Williams et al., 2002). Hamel and Prahalad (1994) have evolved RBV to the core competence concept, with the distinction between core and non-core business that has become very influential in outsourcing practice.

Consequently, organizations may access complementary capabilities from third party firms where no advantage can be gained from performing these activities internally (McIvor, 2009, p. 47). Giving activities which do not constitute a core competence of the organization to other firms, and who can provide these at lower costs is the basis for the "make" or "buy" decision which is also defined as transaction costs.

The TCE approach is based on the assumption, that the transaction is the basic unit of analysis (Williamson, 1981, pp. 549-556). Its primary purpose is to explain why certain industrial arrangements operate with different efficiency degrees (Yang et al., 2012, pp. 4462-4463).

Transactions are thereby defined as actions, in which goods or services are transferred across a technologically separate interface (Williamson, 1981, p. 552). Transaction costs are in this term defined as costs which occur due to misunderstandings, and conflicts, which lead to delays, damages or malfunctions (Williamson, 1981, p. 552). After having assessed the internal and external transaction costs, the efficient boundaries of the firm can be defined.

Based on this assessment, the procurement decision between the two alternatives of make (produce the product internally) and buy (purchase it from an autonomous supplier are made (Williamson, 2008, p. 5)). According to Williamson (1975), only those products and services should be produced internally, for which the internal transaction costs are less than the transaction costs of purchasing these at an open market. The strict focus on these two options only implies that mixed models like joint ventures or franchising are not considered (Williamson, 1981, pp 549, 556).

Further research has revealed (refer to Figure 1), that the factors of transaction attributes and environmental conditions and the factors of industrial arrangement and governance mechanisms are determining both transaction costs and “make or buy” effectiveness (Rindfleisch and Heide, 1997, Yang et al., 2012, p. 4465).

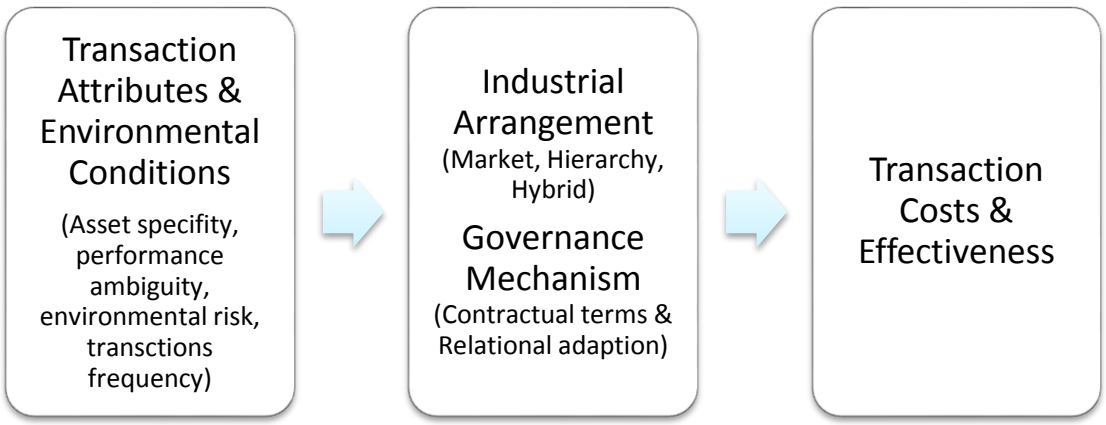

Figure 1 TCE framework (Yang et al., 2012, p. 4464)

From these transaction attributes, statistical results from Yang et al. (2012, pp. 4472-4473) reveal that the environmental risk is the factor with the highest direct influence on outsourcing performance. Furthermore, they indicate that hybrid mechanism such as legal contract and informational adaption are having a strong mediating effect, but this needs to be combined with relational adaption for making outsourcing effective (ibid., pp. 4472-4473).

Whereas further empirical studies have revealed a positive correlation between high asset specificity and hierarchical governance which implies internal production (McIvor, 2009, pp. 46-47, Williamson, 2008), the effect of uncertainty is a further controversy discussed in the literature. Furthermore, Walker and Weber (1987) found that uncertainty can increase the use of hierarchical governance, Harrigan (1986) claims that opposite effect of uncertainty upon the level of hierarchical governance.

Once applying the TCE approach, managers need to consider a wide range of transaction costs. In both the analysis of the external as internal transactions and relative

costs, important cost sources may be missed out. An example of these costs, are the administrative costs in finding an appropriate supplier for the outsourced transactions. Further it needs to be ensured, that the transactions outsourced are operationalized in the desired quality and time. This aspect is often underestimated and can lead to serious delays which result in high costs for the outsourcing organization. Although TCE offers a good decision tool to define whether it is economically reasonable to make or buy products or services in the short run, it lacks the implication of this decision for the strategy and competitive advantage of an organization in the long run.

Another critique of the TCE comes from Conner (1991) who criticises the understanding of the firm existence upon minimizing the opportunistic potential for asset-specific investments. So far, the TCE and RBV were treated as independent approaches for the outsourcing decision. Whereas the TCE concentrates on governance skills and provides sound understanding for analysing market versus hierarchical mechanisms in outsourcing decisions, the RBV explains why firms differ in performance and focuses on the existent inter-organizational collaborations and ways to enhance complementary resources to create competitive advantage (Barney, 1991).

The analysis of the two approaches has showed that both offer a solid understanding and basis for an organization's outsourcing decision. Yet none of the two approaches alone can and should be used in an outsourcing decision case at an organization. Although the two approaches seem to be completely different, there is a complementary nature between both theoretical standpoint, which is based on the characteristic of being difficult to trade or imitate that applies for both distinctive capabilities and specific assets (Peteraf, 1993) . In some cases, the recommendations given from each approach can even be complementary.

An example for such a case would be when an organization obtains the resources needed to develop a difficult-to-imitate capability and the opportunism potential is high, the activity should be internalized (McIvor, 2009, p. 48). Based on the fact, that neither theoretical perspective can completely explain the make-or-buy decision; both perspectives are required in order to obtain a holistic decision basis (Combs and Ketchen Jr, 1999, McIvor, 2009, p. 48) . In Table 1 below, the contradictory and complementary approaches of the two theories are illustrated.

Resource Position	Lower Potential for Opportunism	Higher Potential for Opportunism
Superior	Contradictory RBV – Perform Internally TCE – Outsource	Complementary RBV & TCE – Perform Internally
Weaker	Complementary RBV & TCE - Outsource	Contradictory RBV – Outsource TCE – Perform Internally

Table 1 Complementary & Contradictory prescriptions of the RBV & TCE theory (McIvor, 2009, p. 61)

Table 1 shows, that in some cases, the two approaches give complementary recommendations. For those cases, in which there are contradictory prescriptions, a further analysis of the specific situation is required. In extending the TCE and RBV approaches theorists have started to focus on how capabilities can be built in the operating model to achieve transactional efficiencies through the resource assets. If resource assets are the inputs

into an operating model and transaction efficiencies a performance output, there is gap to understanding the "mediating" operational capabilities needed to convert the resource assets into transactional advantage.

2.1 Operational Capabilities

We define an operations model as the content, structure and interaction of an operation's resources, processes, people and capabilities, configured in order to create customer value. In presenting this definition of an operations model, we refer to the lack of definitional clarity surrounding "business models" more generally and their various contexts (Zott et al., 2011).

A business model is a complex, multi-dimensional concept, which has been defined differently by previous studies (Zott et al., 2011). Generally speaking, it defines the rationale and logic that a firm identifies, creates, delivers and captures value; and illustrates the architecture of the product, service and information flows, the sources of revenue and benefits for suppliers and customers, and the method by which a firm builds and uses its resources to offer its customers better value than its competitors and make money in doing so (Massa and Tucci, 2013, Baden-Fuller and Morgan, 2010) (Li, 2014).

Meanwhile, an operations model is a key part of a business model, as it defines the way a business model works and how the firm implements its strategy, and in particular, how the firm configures its people, processes and technology to create and deliver value to its different stakeholders. Operational capability is the ability to align critical processes, resources and technologies according to the overall guiding vision and customer focused value propositions coupled with the ability to deliver these processes effectively and efficiently (Nada and Ali, 2014, p. 505).

Building on the work of (Porter, 1985) we view the operating model as a source of value creation within the supply chain and a key source of capability. Whilst the capacity of the operating model relates to the resource inputs, capabilities are achieved when you organize your operations (i.e. plant, suppliers, storage, and transport) better than your rivals or you differentiate, in a way unique enough for your operation to survive. For instance, a local designed network could be a capability if it is possesses the agility to respond more efficiently, than global value chains to small scale demand in the narrow market scope of a city.

Employees could be a capability if they possess high levels of creative and design ability. Whilst your suppliers could be a capability if you have strong relationships with them and they can supply you with low lead times (i.e. lean and JIT practices). A summary of representative literature on operational capabilities is provided in Appendix 1. This table illustrates that operating capabilities will enable your operation to meet its performance focus (i.e., quality and responsiveness) and it connects your inputs (strategic resources and assets) to the outputs (transactional efficiencies).

From the periscope of the resource-based view (RBV), an effective sourcing process for a sports car firm, would be one in which it possessed the operational capability to effectively manage its external technological shocks, and use to them to enhance its competitive standing.

2.2 Theoretical framework

Building on these underpinning theoretical antecedents an outsourcing decision framework was developed. The framework is theoretically underpinned by a synthesis of a corpus of literature on TCE, RBV, operational capabilities. The framework is based on three

key characteristics which we have adapted from McIvor (2009). This is illustrated in Figure 2 below.

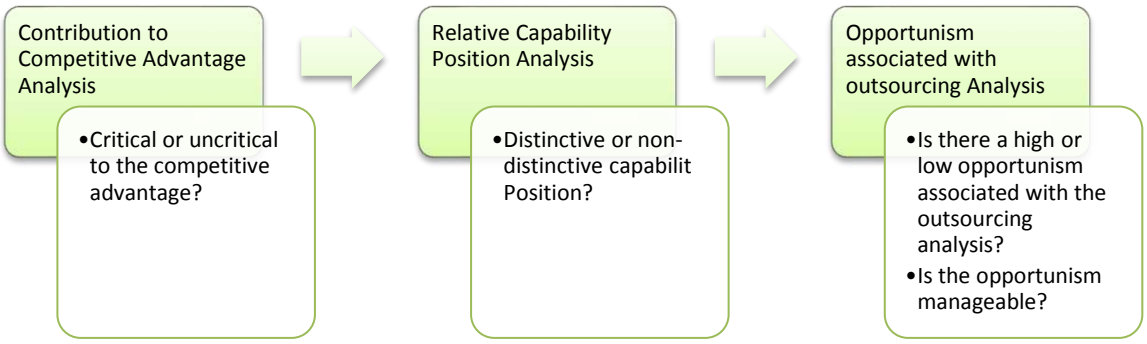

Figure 2 Theoretical framework for outsourcing evaluation (adapted from McIvor, p. 60).

In order to identify the recommended sourcing solution, each potential outsourcing option is checked upon the three key characteristics of its contribution to the organization: i. competitive advantage, ii. its relative capability position and iii. the opportunism associated with the outsourcing analysis. Based on the individual results, specific sourcing options are recommended.

In cases of potential outsourcing decisions, our framework model offers organizations a comprehensive tool, which combines the advantages of the two main theories of TCE and RBV. A further advantage of our sourcing framework is the fact that it also includes inter-organizational collaborations. In the literature, this approach is often referred to as the relational view, which implies the concept of: "how firms can gain and sustain competitive advantage by means of combining resources in unique ways across organizational boundaries" (Dyer and Singh, 1998, McIvor, 2009, p. 48).

The approach has evolved from the limitations of the TCE and as an extension to RBV can thereby be seen as an example of an attempt to combine both theories. As neither in the TCE, not the RBV approach this option is considered, it constrains both approaches in their individual applicability. In the case of the combined framework model, this crucial option is implied which expands its versatility and opens a greater range of alternatives.

According to Hamel et al. (1989, p. 134) strategic alliances and joint ventures (JV) aim to exchange knowledge and can be used to strengthen the partners against outside rivals They are usually established when the participating partners feel it is beneficial to combine their resources and capabilities to gain access to new markets or in order to develop new technologies. The difference of a JV and a strategic alliance is that the latter stops short of forming a separate organization. Based on the fact that both partners usually build up new skills and diffuse the new acquired knowledge throughout their own organizations, the alliance strengthens both partners, although it simultaneously weakens each of them against the other. Therefore the alliance can be also viewed as a new way of competition (Hamel et al., 1989, p. 134).

Although our framework model comprises a wide range of potential sourcing alternatives and offers a structured and theoretical based guideline for potential outsourcing decisions, the model implies also some limitations, which need to be considered when using it as a decision tool. Due to the fact, that both TCE and RBV theories are based on economic rationale, the influence of the political context is little considered in the outsourcing decision. Based on the contradictory prescriptions in some cases, these should be especially analysed with caution.

Likewise, the organizational strategy and the defined sourcing decisions based on the (McIvor, 2009, p. 55) framework needs to be regularly revised. This is due to a central

premise of his framework – "the outsourcing strategy needs to be linked with corporate strategy".

In addition, all three key characteristics may change over time, for which reason a revised analysis would lead to a different sourcing prescription. In spite of these limitations it is a well-tested, internally consistent and rigorous framework which has been successfully applied across a number of studies (Yang et al., 2012).

3.0 Research Method

The data collection method relied primary upon extensive qualitative data acquisition in order to obtain further information upon the trends and their externalities. Based on the following points, the sports car manufacturer Company A offers a qualified organizational setting for an analysis of the trend of alternative driving technologies.

Being a luxury sports car manufacturer, the targeted market segment of the organization includes wealthy customers, which are willing to spend more money on innovative products and technologies. This fact puts the Company A in a considerable comfortable starting position. Apart from this, the trend has already altered the organizational structure and certain business units and can be recognized in the everyday business. This implies that first changes and experiences have already been collected and are therefore available for a qualitative data analysis. For instance, for the visible changes is the decision to set up the new manufacturing line for the new fully electrified Company A sports car, Mission X.

As the manufacturing of a fully electrified car is incomparable to the manufacturing of conventional cars, the management of Company A decided to invest several hundred million Euros in the establishment of the new manufacturing line in mainland Europe.

These issues imply that the changes rooted and triggered of by the trend towards alternative driving technologies are already faced and experienced by the organization, its business units and the employees. Therefore, it can be said, that the ecosystem of Company A is at the current stage at a standpoint, where it has to transform itself and its brand reputation from the traditional sports car manufacturer of fuel engines towards a new and modern mobility provider for exclusive demands. At this unfrozen first stage of change, the organization is relatively open to strategic new organizations and settings (Eisenhardt, 1989, Lewin, 1951).

The conducted case study data collection covered the period from January till August 2017, which implies a total period of eight months. The empirical analysis implies a sequence of 20 conducted interviews with senior managers, team leaders and operational employees from various organizational departments and functions within Company A, various suppliers and experts from the automobile industry as well as primary and secondary literature. These were analysed using the qualitative coding procedure outline by (Molleda and Moreno, 2008).

All the primary evidence including the answers and comments to each thematic characteristic were grouped by company according to the level of agreement/disagreement of identified response patterns. Excel spreadsheets were then used as response matrices to identify patterns of consensus and disagreement, and then to determine similar patterns between the different maker facilities (ibid., p. 117). As the goal of this study is to detect cross-maker we focused on the main items of consensus in every organisation to compare them all together (Roberts, 2000, Poindexter and McCombs, 2000).

The interviews were conducted during various time slots within the mentioned period both at the organization side in Northern Europe. Before the interviews were conducted, the

interviewee was explained about the purpose of the study to identify suitable sourcing strategies based on the alternative driving technologies.

Furthermore, the interviewees were assured, the anonymity of the collected data. The interviews were semi structured. This means, that the interview followed a list of predefined topics and questions. All the interviews were held in a separate room in a one-to-one communication form. The interview content was transcribed, but not recorded. The decision to hold the interview in the described setting was based on the intention to hold the interview in a neutral surrounding in which the interviewee was feeling comfortable. This implies that the interview partners were not distracted by everyday business and the interview surrounding was set in a familiar setting.

Consequently, the interviewee was willing to share more and honest information. By the influence of third persons in the interview surrounding, the data generated could get biased. The decision not to record the interviews was taken based on the same assumptions. In the absence of a recorder, interviewees were sharing a greater amount and more in detail information upon their personal opinions.

The initial interviews were covering a broader range of topics. Later interviews were gradually reshaped by the findings of the first interviews. This enabled the critical reflection of stated opinions and assumptions. Besides the data generation from the conducted interviews further access to a wide range of internal documents and information were given.

The usage of a qualitative approach has advantages and disadvantages. Due to the timeliness of the trend, economical available data upon this issue is rare. Furthermore, it is yet unclear, how and to what extent, the trend will affect the industry. Therefore, a quantitative analysis of data was offering limited options. The data generated is resulting from qualitative data analysis from a range of industry experts.

The limitations and disadvantages of the qualitative approach is the bias of the interviewee. In order to minimize this bias, a number of measures were conducted. First the interview sample group was extended from organization internal interviewees to industry wide experts. This ensured that the conducted findings were not seen through the lens of the organization, but were similarly recognized within the industry. Secondly and in order to avoid problems of hierarchical bias, interviews were conducted at different hierarchical levels within the organization as well as within different organizational functions and departments.

The selection of the sample group further implied members, with different tenure at the organization. Thirdly, all interviewees were asked to name other potential interview partners which had similar or different standpoints on the trend after the interview. By doing so, it was ensured that contrasting perspective was respected. The interview schedule is attached in the appendices of the paper.

We aimed to advance our knowledge of the sourcing constructs outlined in the classification stage, through their thematic extension with primary data (Eisenhardt, 1989). Through the thematic interplay of data with theory we could now confirm, modify or reject parts or the whole framework categorization.

4.0 Initial findings at Company A

4.1 Contribution to Competitive Analysis

The results of the case study suggest that the emobility trend is significantly impacting on the procurement department at Company A. In addition, it is impacting unequally on the capabilities of their different suppliers. Whereas the combustion powertrain procurement has experienced yet only gradual changes resulting from the trend, the electric

procurement department is affected to a much large extent. Concerning the combustion engine powertrain issues, our analysis revealed, that there is an ongoing trend towards an increasing concept responsibility (KV) quote and a bundling of components.

The increasing KV quote trend implies that the competence, knowledge and responsibility of the engineering of components have shifted from the OEM to the suppliers, which has released internal capacities within the engineering department. Likewise the bundling of components decreases administrative capabilities within the purchasing department. Resulting from the firm undertaking "knowledge *sourcing"*[1], the freeing up of capacities is a crucial process in order to improve the innovation potential within a department and to allow the employees to gain competences in further areas. Hence the freeing-up of capacities at the OEM requires a transfer and installation of these at the supplier side.

This trend can be explained by the RBV. Although the resources of an organization are limited, they can be reconfigured to a certain extent. In order to reconfigure these resources, they need to be released from their current position before being reconfigured. In terms of the powertrain components for the new electric cars, these are sourced by the electric procurement department. The main parts for the electric powertrain are the battery, the pulse converter and the e-machine. The decision to assign the electric powertrain components to the electric purchasing department was based on the technological proximity between the existing electric product portfolio and the new electric powertrain components.

Although there exists similarities between the components, the sourcing situation for the new 21 powertrain components varies to a large extent to the sourcing of the existent

[1] Knowledge sourcing is the process by which organizations and individuals who are in search of certain expertise can avail them by connecting with the right individuals in the organization or through the use of external suppliers (Williamson, 2008, p. 17).

electric components portfolio. But based on the fact, that the configuration and composition of these three parts impacts on the power, speed and performance characteristics of Company A's future electric car.

Resulting from the qualitative analysis, the e-machine, the pulse converter and the battery are the central parts of the powertrain for an electric vehicle. All three components contribute to a large degree to the future characteristics of the electric car and thereby constitute a high contribution to the future competitive advantage of Company A

As the technology for each component is still in its engineering beginnings, the opportunism potential for each component is expected to be high. Therefore, the strategic relevance for each of the mentioned three components is very high. In terms of the e-machine and the pulse converter, the contribution to the future core competences of the organization are also very high. Based on the business strategy to convert the product portfolio gradually upon 22 electric vehicles, the possession of core competences within the e-machine and pulse converter field will be a crucial competitive advantage factor for A

4.2 Relative Capability Analysis

Although the competences for each product category of the electric powertrain has to be acquired from scratch, the evolvement speed in knowledge acquisition for each component is different. Based on the shorter technological proximity of the e-machine and the pulse converter to the traditional electric purchasing portfolio, the knowledge acquisition speed of these components is faster than the one upon the battery, which is still in its beginnings.

Based on the fact, that the engineering and manufacturing of the traditional cars did not require in-depth chemical knowledge, the competence upon this field is still in its beginnings. Therefore, the technological proximity between the competences and capabilities

required to engineer and manufacture batteries and the existent competences, at Company A, is still very large. Bascially, there is a capability gap at Company A in its ability not only to manufacture the batteries but also they are heavily reliant on knowledge sourcing to their suppliers. For instance, the research and development of battery technology.

The firm is strongly increasing its capacities within the field of the electric car; the focus is currently at setting up human and technological capacities within the field of the machine and the pulse converter. Consequently, the engineering and partial manufacturing of e-Machines and pulse converters is defined to become a future core competence of Company A. Hence the sourcing strategy needs to support this potential whilst proving the optimum sourcing option for the organization to achieve its future core competence. In the case of the battery, the manufacturing would require the setting up of a specific battery factory which would tie up too much capital. That would be required at the current stage to adjust the manufacturing lines and sourcing process to build the new electric cars.

By having defined its mission in providing the customer an exclusive and dynamic mobility experience, Company A's core competences are still bound to the engineering and manufacturing of sports cars. Nevertheless, the battery represents an important component for the electric car, as it contributes to the power characteristics of the future electric car. Therefore, the strategic relevance of the battery is still high.

The eMachine as well as the pulse converter were assigned by our interviewees into the "knowledge sourcing" category. The firm have slightly more knowledge capability with the pulse converter technology than they do with the eMachine. The speed of external technological change is such that there is an "implementation gap". This is because there is slow "process diffusion". This is the diffusion of the required knowledge, which would need to be implemented quickly, so the sourcing process could be reconfigured to optimise the fast

changing technologies. These would need to be implemented much more quickly, to add value to their component design and manufacture. Although the e-machine and pulse converter technology is relatively new for A, it obtains already basic competences within related technological areas, for which the technological proximity between the capabilities can be defined as medium.

4.3 Potential for Opportunism

The potential for opportunism was identified by Company A to be most likely achieved through the establishment of strategic alliances, combined with the option of a CVC[2] investment. This could be integrated into the knowledge sourcing portfolio of Company A. This sourcing strategy suggestion is also complementary to the sourcing strategy of Tesla, which is committing itself into a strategic partnership with some of its crucial suppliers in order to source knowledge.

For the e-machine and pulse converter, the potential suppliers have no automotive experience and the market for such components still needs to establish itself. In order to ensure further knowledge sourcing upon the e-machine and pulse converter, Company A should establish strategic alliances with the technological most advanced partners in order to acquire the crucial core competencies and capabilities that will ensure the organizations competitive advantage in the long run.

There are slightly more opportunities for pulse converters than the eMachine component. Although "A" has not yet committed itself into such a strategic partnership, the innovation potential resulting from the collaboration work with its suppliers and the speed of

[2] This acronym refers to Corporate Venture Capital.

acquiring further competencies within the operating field is yet immense and underlines the potential of such collaborations.

Considering the recent established strategic partnership between Volvo and Siemens (Handelsblatt, 2017), Company A could evaluate and define which strategic partnership to implement in order to ensure its future knowledge sourcing access. In terms of the battery, the situation is different. Although the strategic relevance of the battery is also very high, the contribution to the defined future core competences of Company A of this component is low.

A negative example of an organization trying to overcome this "OEM-supplier" gap are Nissan and Renault, which decided to manufacture the battery themselves, but failed due to the strategic advantage their battery suppliers had, a gap which could not be closed within time. However, there are examples such as OEM Daimler, who are currently setting up a battery assembly factory which suggest that not all firms have given up in trying to make their own battery technology. .

Though as with Company A, Daimler faces a large capability gaps towards the cell production technology and is therefore concentrating on the assembly of the battery components only, trying to obtain further knowledge in this field via small incremental adjustments. Unlike Daimler and Company A, the OEM Tesla contains a different technological background, for which the capability gap between Tesla and its strategic alliance with Panasonic is lower.

Consequently, for Company A the recommended sourcing strategy is to implement a sourcing platform for the battery components. Within such a platform, they can gradually and slowly obtain further knowledge upon the component, while the responsibility of the engineering and configuration of the battery remains at the supplier.

Further, “A” can define the framework conditions for the components, which the various suppliers then can use in order to engineer and adjust their components. In doing so, Company A needs to ensure a competitive and cooperative climate within the platform. This will nurture further innovations, which are based on the network effect supporting the value of the platform will be more complementary than competitive (Gawer and Cusumano, 2014).

4.4 Advancement of the Framework

The key findings of the case study are presented in Table 2. The e-machine, the pulse converter and the battery are the central parts of the powertrain for an electric vehicle. All three components contribute to a large degree to the future characteristics of the electric car and thereby constitute a high contribution to the future competitive advantage of Company A.

Component	Sourcing process	Contribution to competitive advantage	Relative capability position	Opportunism
Battery	Outsourcing physical production	High but the firm reliant on its suppliers who have more advanced technological know how and capabilty to manufacture. High contribution to competitive advantage (in particuar cell production).	Engineering shifted from the OEM to the supplier. Manufacturing would require the setting up of a specific battery factory which would tie too much capital that is required at the current stage to adjust the manufacturing lines to build the new electric cars. Low capability position.	Collaborative sourcing (but not partnerships) with battery suppliers. There is low opportunism associated with the batteries smallest component (i.e. cell production). The investments for such a cell production would capitalize too much investment for Company A. The potential for future cost reductions due to economies of scale and process improvements are smaller than the potentials implied in other components.
Pulse Converter	Knowledge sourcing	Bundling of components. Engineering and partial manufacturing. Contribution to competitive advvantage is high.	Human and technological capacity and capability is being built within the organization. Slightly more developed than the e-Machine. Medium operational capabilities and resource assets to deal with knowledge evolution.	Establish strategic alliances with the technological most advanced partners. More opportunities for strategic alliances relative to the other two components.
e-Machine	Knwoledge sourcing	Bundling of components. Engineering and partial manufacturing. High contribution to competitive advantage.	Human and technological capacity and capability is being built within the organization. Medium operational capabiltiies.	Establish strategic alliances with the technological most advanced partners

Table 2 Advancement of the Framework

As the technology for each component is still in its engineering beginnings, the opportunism potential for each component is potentially be high. However, in terms of the e-machine and the pulse converter, the contribution to the future core competences of the

organization is also very high. It is apparent that the possession of core competences within the e-machine and pulse converter field will be a crucial competitive advantage factor for A.

The firm therefore classifies the eMachine and pulse converter as “knowledge sourcing”. They accept that a combination of the speed of external technological change, together with gradual internal adaption and integration of the required knowledge (needed by the firm) into their sourcing processes (to optimize their efficiency), implies that they are not yet in a strategic position to acquire the needed resources within time.

For the e-machine and pulse converter, the potential suppliers have no automotive experience and the market for such components still needs to establish itself. In order to speed up their acquisition and diffusion from their policy of “knowledge sourcing”, Company A should establish strategic alliances with their technologically most advanced partners. This is needed if they are to acquire the crucial core competencies and capabilities that will ensure the organizations competitive advantage in the long run.

Although it has not yet committed itself into such a strategic partnership, the innovation potential resulting from the collaboration work with its suppliers and the speed of acquiring further competencies within the operating field is immense and underlines the potential of such collaborations.

Considering the recent established strategic partnership between Volvo and Siemens as well as current discussions upon further strategic alliances between OEMs and these component suppliers (Handelsblatt 2017a,b), Company A should evaluate and define which strategic partnership to implement in order to ensure its future knowledge sourcing access.

In terms of the battery, the situation is different. Although the strategic relevance of the battery is also very high, the contribution to the defined future core competences of

Company A of this component is low. This judgement of Company A was based on the technological proximity between their partners and the low potential for opportunism within the cell production.

The low opportunism associated with the batteries smallest component, the cell production, results from two major points. First, the investments for such a cell production would capitalize too much cash for Company A. Further, the profitability of such an investment would not support the organizations business strategy. Second, the raw material cost would currently comprise above two thirds of the total costs of the cell. This implies that the potential for future cost reductions due to economies of scale and process improvements are smaller than the potentials implied in other components.

Facing a large capability gap, the sourcing of knowledge cannot be conducted efficiently. So they rely on suppliers for both knowledge and physical component supply.

4.4 Theoretical Contribution

This work makes a contribution to the operations capability literature. It highlights the important role that sourcing will play to achieving strategic advantage in the electric sports car segment. Four key operational capabilities are emerging in the operating model. The first links to “capacity” and the ability of suppliers to be locally based so that they can deliver high quality products and services in the minimum time (optimizing the “time-value” configuration).

The second is the “design” of the supplier network. This needs to be configured to optimize all supply chain assets and needs to be agile enough to deal with non-tangible movements in knowledge and innovation advancement. Such movements can be unpredictable and difficult to forecast.

The third relates to "supplier management". Suppliers will add capability through their ability to be innovative and creative and increasingly be strategically positioned as service innovators and service solution providers, rather than product manufacturers. Close supplier relationships, supplier development strategies and joint partnership working on building tacit knowledge, technological know-how and innovative capacity will be the key sources of future advantage. The skills and training of buyers in new technologies such as big data and smart city technologies will enable emerging opportunities in local city markets to be identified and realised.

Finally, the fourth capability relates to the ability of the firm to "integrate" and "align" their marketing and IT planning processes with their sourcing process. The sourcing process needs to implement marketing decision instantly in the emerging 21st century market for electric sports cars if the firm is to remain competitive. The market is evolving rapidly and the fluidity of the service-product environment towards customisation requires a hyper-efficient lean production focus.

5.0 Conclusion

Resulting from the trend towards electric cars, the automobile industry is expected to be fundamentally reshaped. Thereby the European OEMs, including the sports car manufacturer "A", will need to rethink and adjust their business and sourcing strategy in order to keep their superior global brand and market leader competitive position.

They are facing an unprecedented market threat from new entrants not only from the US, but also from state-backed firms emerging in China, India and other countries. Countries, who are investing public funds to subsidise commercial firm R and D, and are fiercely pushing their firms to be market leaders in the electric sports car sector. One crucial factor will therefore be the decision upon the new component and resources setting, in which the

organization needs to define which of the parts of the value creation process should be kept internal and which parts should be outsourced.

Throughout our adaption of a sourcing framework and extension to consider operational capabilities, we have begun to answer the research question of: how the sourcing process for the supply of new electric powertrain components is being transformed? These initial findings, we intend to expand with more advanced case study work with our firm that will involve empirical modelling of process efficiency and inventory management.

Implications for Practitioners

Our work closes the gap regarding the need for practical application tools, designed for process managers, who are being confronted by turbulent, unpredictable and fast moving technological-driven market environments. Although the sourcing framework was developed to test the impact of the electric mobility trend, it can likewise be applied for the sourcing of components in other fast changing environments as well. Therefore, it can be adopted for defining the appropriate sourcing strategy for "security" and "safety" device components. This is due to the fact that the sourcing framework is governed and directed by organizational strategy, which is a considerable solid factor that remains constant in fast changing environments.

Furthermore, the basement on the strategy assures that the sourcing strategy does not interfere with the business strategy, which could cause harmful consequences. Besides the model offers a good decision guideline for management, the decision criteria for categorizing the specific component in either area could be analysed and defined more accurately by further research. This would minimize the effect of personal bias on the categorization as well as making the strategic sourcing decision between the organizations more comparable.

Similar to any other strategic tool, the recommendations generated by the strategic sourcing framework needs to be reviewed and verified on a regular basis. This needs to be done at least in simultaneous routine as the business strategy is revised, in order to assure their alignment.

Implications for future research

In addition to more detailed operational analysis at Company A we intend to explore the role that local enablement (by smart city planners) will play in the diffusion of electric sports vehicles. We intend to build our research programme to explore ten smart cities around the world to determine the impact of local infrastructure spending and policy initiatives, on the speed of diffusion of electric sports cars and the evolution of local supplier networks.

The issues of small production scale and narrow geographic scope, together with audits of local capacity and capability will provide the theoretical and practical (policy) focus for our investigation. The aim will be to longitudinally investigate (up to 5 years) the impact of different city eco-systems, on the sourcing of electric vehicle components (B2B) and multi-stakeholder relationships (within the context of the smart city).

The supply chain network capability impact of "public/private" hybrid initiatives such as infrastructure provision and the electric vehicle is an interesting area to explore. Whether cities are prepared to develop local production spaces to service electric vehicles and help assist in developing the skills, capacity and capabilities needed to sustain and scale up local operating models are still areas to be explored and investigated.

We are entering a new era where cars could theoretically be made and distributed locally and serviced within a city space (by a city network configured on a "low time-high value" configuration) but this will require smart city planners to work closely with the

electric sports car manufacturers. How this impacts on the sourcing process, capabilities and capacity is a question we will be considering answering in our future investigations of the factors influencing the sourcing process of electric vehicle components.

6.0 References

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Appendix 1 Summaery Table of Operational capabilities literatures

Authors	Operational capabilities
Peng et al. (2008)	Routine based approach to studying operational capabilities. Investigate manufacturing capabilities at the plant level where they are actually realized. Two main operational capabilities as the unit of analysis "innovation" and "improvement". Operations decisions involve assessing specific processes and resources available to determine their potential contribution to the needed capabilities, and integrating individual routines into consistent bundles to achieve the desired performance. This research contributes to this end by conceptually linking routines to capabilities and performance, thus enhancing our understanding related to the specific ways in which capabilities can be built.
Srai and Nand (2013)	Operations strategy refers to how firms develop and combine resources and capabilities to achieve long-term competitive goals (Bates et al. , 1995; Boyer and McDermott, 1999). Capabilities are the means by which resources in a firm are arranged to effect a desired end (Amit and Schoemaker, 1993; Grant, 2002; Helfat and Peteraf, 2003; Makadok, 2001; Tracey et al. , 1999). "*Cost", "quality", "flexibility" and "delivery"* have been identified as the main operations based capabilities (Hayes and Wheelwright, 1984; Boyer and Page, 2000; Ward et al. , 1995). While some researchers have proposed other capabilities such as innovation (Noble, 1995), operations management researchers generally accept cost, quality, flexibility and delivery as the main operations related capabilities. The cost capability refers to how competitive a firm is with respect to the cost of producing and providing its products or services to its customers, and is generally measured as the unit cost of product/service offered. The second capability of quality refers to the extent to which the products/services that are provided meet the expectation of the customers (Garvin, 1987). This is usually measured in terms of customer satisfaction levels. The delivery capability refers to the firm's ability to meet the promised provision of product or service within a timely manner (Lau Antonio et al. , 2007). It is usually measured in terms of deviation from expected delivery time. Finally, flexibility capability requires a firm to have the capacity to meet the contingent requirements of customers. This is usually measured as a composite of requisite variety with sufficient volume.
Kortmann et al. (2014)	Two ambidextrous operational capabilities i.e., mass customization capability and innovative ambidexterity fully mediate the relationship between strategic flexibility and operational efficiency in India and the US.
Coltman and Devinney (2013)	Research allocation choices managers make between 6 distinct operational capabilities (customer engagement, cross functional coordination, creative solutions, operations improvement, IT infrastructure and professional delivery). They show how these capabilities interact service context moves from a basis of commoditization to one of customization.
Xia et al. (2016)	They develop a software capabilities system to realise various functionalities. These include team coordination, higher visibility, co-located development and efficiency improvement in communication.
Gralla et al. (2016)	This work explores problem solving transport and humanitarian capabilities for dealing with urgent and ill- defined operations management problems.

Davies and Brady (2016)	The authors distinguish between project capabilities at the operational and dynamic capabilities at the strategic levels, arguing that firms depend on identifiable dynamic capabilities (e.g. portfolio management techniques) to know when and how to maintain current project capabilities and when to modify or replace them depending on the conditions encountered. Furthermore, the relationship between dynamic and project capabilities is found to be reciprocal, recursive and mutually reinforcing. In the proposed reciprocal relationship, the emergence of new or declining project capabilities provides indications for the strategic priorities, behaviours and future deployment of an organization's dynamic capabilities.

Appendix 2 Interview Guide

1. The trend towards electric mobility is expected to have a transformational impact on the automobile industry. What do you think about this trend?

2. Which advantages and disadvantages do you see concerting this trend? Do you see the advantages or disadvantages predominating?

3. How does the trend affect your daily business? Did you experienced any major changes?

4. Which challenges do you see related to the trend towards electric vehicles for the total industry?

5. Which challenges are you confronted with in your daily business resulting from the trend towards electric vehicles?

6. Did the trend affect the composition of your business partners? If yes, please give examples.