

**STRATEGIC SUPPLY CHAIN MANAGEMENT  
IMPLICATIONS OF AN UNREGULATED BREXIT**

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- Title/Topic:** Strategic Supply Chain Management Implications of an Unregulated BREXIT
- Problem definition:** Due to the integrated, complex and long supply chain structure of the automotive industry and the large size of cross-border trade of components and cars between UK's and EU's automotive supply chain actors, the implementation of a tariff scheme and custom handling procedures in the event of an unregulated (hard) BREXIT by March 2019 negatively affects the industry. The fundamental Four Freedoms are hindered resulting in an increase of sourcing costs. Assembly parts and distribution of final cars becomes costlier. The crucial JIT (just-in-time) philosophy is jeopardized due to the requirement of safety stock and custom checks.
- Purpose:** The purpose of this thesis is to develop a case study providing students with an effective way to apply Strategic- and Supply Chain Management (SCM) concepts based on a real case scenario of automobile industry (BMW). Professors are provided with resolution documents to effectively assess students' solutions.
- Methodology:** A deductive approach was adopted in which the causal relationship between a hard BREXIT and strategic SCM implications is elaborated. A qualitative exploratory method was adopted, and the nature of the collected data is primarily qualitative, but also entails quantitative elements. Data was retrieved from scientific articles, industry specific reports, company reports, interviews and documentation from BMW.
- Conclusion:** A hard BREXIT presents great challenges for BMW and their suppliers. BMW should foster cooperation with suppliers and engage in more backward integration policies to secure supply of strategic components and avoid supply stops. Supply network flexibility is crucial to maintain a sustained competitive SC. To offset trade barrier costs, BMW should partially shift MINI and eMINI production from the UK to other suitable European countries such as Hungary or the Netherlands and the company

## Strategic SCM Implications of an unregulated BREXIT – A Case Study

should aim towards more local sourcing in the UK for more standardized components.

**Keywords:** BREXIT, Strategy, Supply Chain Management, Automotive

**JEL Classification:** F20 General and L62 Automobiles Other -Transportation  
Equipment - Related Parts and Equipment

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## List of Abbreviations

<b>Abbreviation</b>	<b>Meaning</b>
<b>BMW</b>	Bayerische Motoren Werke
<b>BMW AG</b>	Bayerische Motoren Werke Aktiengesellschaft
<b>BFW AG</b>	Bayerische Flugzeugwerke Aktiengesellschaft
<b>BREXIT</b>	Britain's Exit from the European Union
<b>CEO</b>	Chief Executive Officer
<b>EC</b>	European Council
<b>e.g.</b>	For example
<b>EU</b>	European Union
<b>EU-28</b>	Member states of the European Union
<b>EV</b>	Electric Vehicle
<b>JIT</b>	Just-In-Time
<b>MNC</b>	Multinational Corporation
<b>MTO</b>	Make to Order
<b>MTS</b>	Make to Stock
<b>N/A</b>	Not applicable
<b>OEM</b>	Original Equipment Manufacturer
<b>PLC</b>	Product Lifecycle
<b>R&amp;D</b>	Research and Development
<b>SCM</b>	Supply Chain Management
<b>SMMT</b>	Society of Motor Manufacturers and Traders
<b>SC</b>	Supply Chain
<b>TPP</b>	Trans-Pacific Partnership
<b>UK</b>	United Kingdom
<b>WTO</b>	World Trade Organization

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## 1 Introduction

Firstly, this chapter discusses the underlying issue of this case study followed by the target audience which the case addresses. Thirdly, the educational objectives are outlined. Please note, the words “unregulated” and “hard” are used interchangeably throughout this report.

### 1.1 Problem Definition

Theresa May, Prime Minister of the United Kingdom (UK) and Leader of the Conservative Party, triggered Article 50 of the Lisbon Treaty on March 29, 2017 notifying the European Council (EC) of the UK’s intention to withdraw from the European Union (EU), commonly referred to as BREXIT. Ahead lies a complex 2-year negotiation period between the UK and EU in which agreements need to be reached in terms of the UK’s withdrawal from the bloc and future relationship with the EU (European Commission, 2017). For a timeline regarding BREXIT, please refer to *Appendix A*.

Given the “hardline” political stance of May’s Conservative Party and the so far ineffective and slow negotiation rounds between the UK and the EU a realization of an unregulated BREXIT is assumed. In fact, a hard BREXIT results in the UK leaving the EU single market, as well as the customs union (Manager Magazin, 2017). The trading relationship between the UK and EU would be governed by the trade rules of the World Trade Organization (WTO). This unregulated scenario with no trade deal in place disrupts complex and integrated supply chains in the UK and EU automotive sector which rely on “tariff-free” multi-cross border trade for car components. In fact, sourcing of assembly parts, as well as the distribution of vehicles between the UK and EU becomes costlier, less efficient and more complex. Statistics from the Society of Motor Manufacturers and Traders (SMMT) reveal that a hard BREXIT would likely increase the cost of an average car produced in the UK by around £2000 ( $\approx$  €2,240) and supply chain (SC) complexity is drastically increased (PA Knowledge Limited, 2017).

Due to the increasing integration of SC’s, multi-national corporations (MNC’s) move their goods back and forth among various EU member states (The Economist, 2017). This provides automotive manufacturers and other industrial businesses with headaches as their business models and SC’s likely require re-design due to the implementation of trade barriers and increased custom handling procedures which decreases SC efficiency and negatively impacts Just-In-Time (JIT) processes.

The following lists key issues which must be taken into consideration by automotive SC managers with UK and EU operations (PA Knowledge Limited, 2017):

- **added costs** for automotive manufacturers, component suppliers and engine suppliers due to:
  - additional tariffs on goods traded between UK and EU;
  - higher admin costs in relation to border checks and custom handling procedures;
    - to provide a brief idea, additional bureaucracy for German component suppliers amounts to estimated 500 million Euro annually solely for custom handling processes.
  - higher inventory/warehousing costs given increase of safety stock for components to ensure uninterrupted and JIT supply to manufacturing plants;
  - higher bureaucratic costs in relation to VAT tax procedures.
- **longer lead times** due to custom handling procedures and border delays which might result in lost sales for dealers. Moreover, the crucial JIT philosophy will likely be negatively affected requiring a build-up of inventory to safeguard seamless production and meet demand.

*“The BMW group has always made clear that we believe integration of the UK into the EU single market, maintaining free movement of goods, services, capital and talent, would be best for business. What’s important for us is that the UK’s negotiations with the EU result in uncomplicated, tariff-free access to the EU single market in future.”* – BMW Group (Guardian News and Media Limited, 2017).

## 1.2 Target Audience of the Case

The target audience of the case is divided into three main groups namely professors, students and automotive industry professionals. Considering the managerial fields of the case study, the target audience is broadly classified into Bachelor and Master students who follow management study programs and professors lecturing business management, especially in the fields of logistics, operations and strategy.

## 2 Literature Review

An unregulated BREXIT scenario affects automotive MNC's with significant EU-UK operations in many ways. On a strategic level, OEM's like BMW manufacture the MINI in the UK, source a large share of components from Europe, and finally sell a large volume of MINI cars in Europe will be challenged by trade barriers such as custom handling procedures and tariffs on components (4.5%) and cars (10%). Strategic options, especially regarding the design and structure of the SC must be assessed and potentially adapted to the new geopolitical scenario in case it takes effect. Therefore, the literature review focuses on 2 main theoretical concepts namely *Strategy* and *Supply Chain Management*.

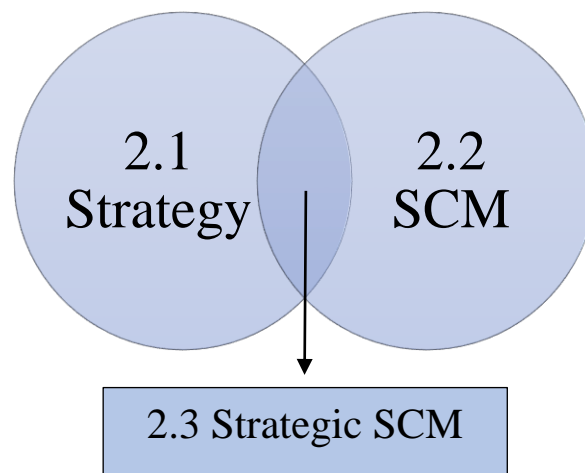


Figure 1: Concepts of the theoretical framework, 2018

Figure 3 depicts the two theoretical concepts that the case study addresses including ultimately the merge of the two concepts: *strategic SCM*.

### 2.1 Strategy

The classic book, *The Art of War*, written by Sun Tzu probably around 500 BC, is regarded as the first paper on strategy in which origins of the concept are explained. Most of strategic business concepts and theories are built around the principles of military strategy since enterprises and armies require strategies for the same reason – provision of direction and purpose, effective deployment of resources, and the coordination of decision making by different persons (Grant, 2016).

Thomas et al. (2013) states that the fundamental concept of strategy derives from historic Greek, Chinese and European backgrounds. Machiavelli's (1515) *The Prince*, and Tzu's (2000) *The Art of War*, discuss origins of the concept and strategy was treated mainly as a political and/or

military concept and did not find inclusion within the field of management until the 20<sup>th</sup> century (Pederzini, 2016).

The first books dealing solely with strategic management emerged in the 1950s and 1960s although Alfred Chandler’s (1962) *Strategy and Structure*, is regarded as one of the first books linking strategy with business settings (Pederzini, 2016). Chandler (1962) *defines strategy as*: “*The determination of the long-run goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals.*” (Grant, 2016, p. 15).

Strategic management as a field of study was largely driven by two broad considerations to define firm success namely a view towards internal or external factors. Hoskisson et al. (1999) have explained the tendency of research shifting between an external and internal view like the swings of a pendulum (Guerras-Martín, Madhok, & Montoro-Sánchez, 2014). Every swing of the pendulum highlights new theories and methodological approaches within the two broad cultures; positivist and interpretive culture. A positivist culture is influenced by economics, quantitative methodologies, rationality and an “*external*” view on industry dynamics. An interpretive culture is influenced by human factors, qualitative methods and the “*internal*” view is directed more at the organizational level rather than industry level (Pederzini, 2016).

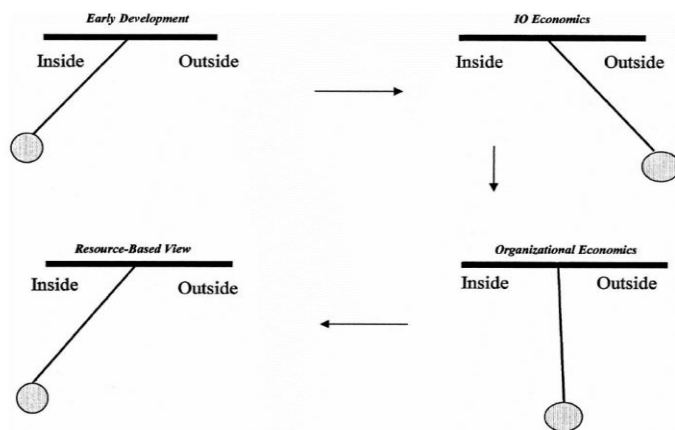


Figure 2: Swings of a Pendulum: Theoretical and Methodological Evolution in Strategic Management, adapted by (Hoskisson, Hitt, Wan, & Yiu, 1999)

Throughout the 1960s, the early development of strategic management research has its emphasis on organizations internal processes and characteristics. The works by Penrose (1959), Chandler (1962) and Ansoff (1965) are largely driven by identifying firms “*best practices*” through looking inwards and assessing the internal and unique competitive resources resulting in firm success. The fit between strategy and corporate structure, as well as firms’ internal

strengths and weaknesses are assessed to understand the performance driving factors (Hoskisson, Hitt, Wan, & Yiu, 1999).

In the 1970s and 1980s, the research focus shifted externally towards industry structure and the influence of economics, especially industrial economics, on strategic management research was significant (Hoskisson, Hitt, Wan, & Yiu, 1999). Porter (1981) states that the Bain/Mason Industrial Organization (IO) Paradigm or structure-conduct-performance (S-C-P) paradigm changed the research focus from the firm to the industry. The central principle is that industry structure (economic and technical considerations) determines conduct (firm decisions), which explains the overall performance (e.g. profitability, technical efficiency) of the firms and thus, conduct can be left out of the equation since performance can be directly explained by industry structure (Porter, 1981).

The S-C-P paradigm was criticized once scholars realized that industry structure represented only a part of the equation (Pederzini, 2016). The field of IO does not clearly assess concepts of industry structure and Porter contributed significantly to the field of strategic management by applying IO logic. Porter (1980) developed the Five Forces Model, an analytical tool which assesses the industry attractiveness on 5 variables: industry competition, bargaining power of suppliers, bargaining power of buyers, threat of substitution and threat of entrants (Hoskisson, Hitt, Wan, & Yiu, 1999). Porter's (1985) value chain analysis serves as an analytical tool to assess which organizational functions create/capture value (*Appendix B*). Ansoff (1965) defined corporate strategies based on two dimensions namely products and markets. The four possible strategic options are market penetration, market development, product development and diversification (*Appendix C*) (Ansoff, 1965).

Throughout the 1980s, the pendulum had swung back towards a middle position incorporating internal and external aspects given the development of transaction cost economics (TCE) and agency theory, two concepts within the field of organizational economics. According to Coase (1937), the critical foundation of transaction costs theory is that organizations exist given the likely higher transactions costs between firms than within firms. TCE logic was applied to better understand the formation of multi-divisional businesses, hybrid organizations and international strategy. TCE and agency theory contributed significantly, although scholars like Barney (1991) and Wernerfelt (1984) argued that the heterogeneity among firms within the same industry is crucial as some firms are better in managing transaction costs, while others are more effective in responding to competitors' actions.

Finally, the pendulum swung back to the starting point (internal view) with the emergence of the Resource Based View (RBV) – roots in Penrose (1959) internal focus on organizational factors - in the 1980s and 1990s and the notion is that firms differentiate themselves primarily in their resources relative to their external environment to achieve sustained competitive advantage (Pederzini, 2016). The works from Wernerfelt (1984), Prahalad and Hamel (1990) and Barney (1991) provided substantial contribution to the RBV approach. Grant (2016) describes two factors influencing the growing emphasis of resources and capabilities for strategy formulation:

- 1) Increased unstable industry environments
- 2) Competitive advantage rather than industry attractiveness increasingly perceived as primary source of superior profitability

The notion is that the ever-increasing changes in the external environment shifts the importance from market focus to an internal focus for long-term strategy formulation. According to Barney (1991), a firm resource must be heterogenous and immobile to potentially lead to sustained competitive advantage, as well as have VRIO characteristics: valuable, rare, inimitable and non-substitutable (Barney, 1991).

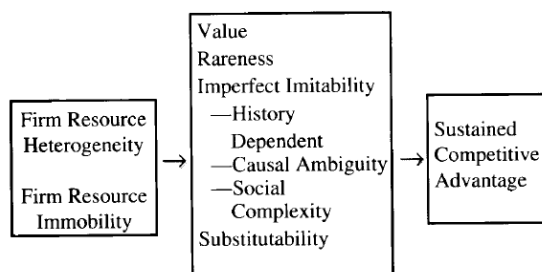


Figure 3: The Relationship between Resource Heterogeneity and Immobility, Value, Rareness, Imperfect Imitability, and Sustainability, and Sustained Competitive Advantage, adapted by (Barney, 1991)

Figure 3 illustrates the VRIO framework which has been predominantly provided by the works of Barney (1991, 1995). It entails four key elements namely (El Shafeey & Trott, 2014):

- **Assumptions:** firm resources are heterogenous and immobile;
- **Firm resources:** bundle of tangible and intangible resources and competencies;
- **Characteristics of strategic resources:** strategic resources must meet the 4 VRIO attributes; and

- **Path to sustained competitive advantage:** three main types of competitive positions are identified namely competitive disadvantage (temporary & sustained), competitive parity and competitive advantage (temporary and sustained).

The VRIO framework in tabular form can be found in the appendices of the pedagogical note (*Appendix D*).

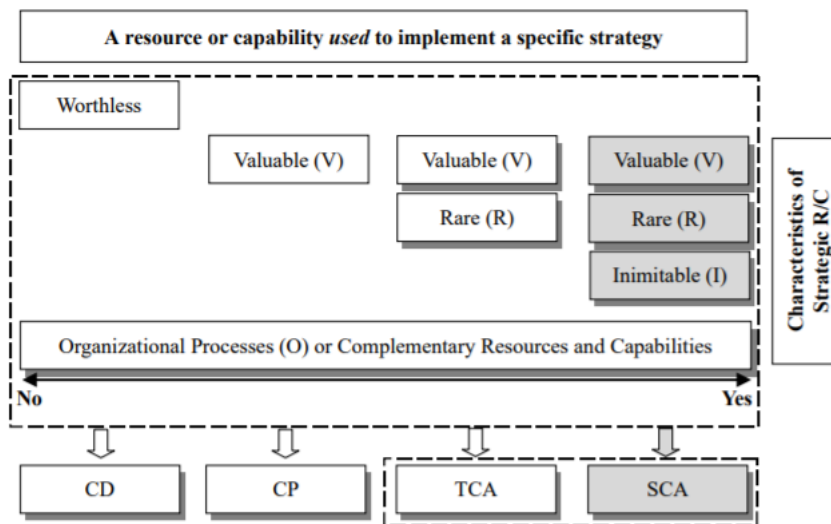


Figure 4: The VRIO framework of the RBV of the firm, adapted by (El Shafeey & Trott, 2014)

Priem and Butler (2001) expressed critical points of the RBV such as the tautological problem of the theory and the static problem meaning that the model does not consider the dynamic nature of the competitive environment of the model (Brahma & Chakraborty, 2011). Sanchez (2008) critique is directed towards the lack of distinction among resources (capital, physical, human, organizational) in terms of their functional and social features and therefore prohibits the ability to suggest interrelationships among the “ad hoc” listed resources. Sanchez (2008) also criticizes the so called “R-dilemma” referring to the dimension “rarity” in the VRIO framework. He argues that all resources are becoming unique or rare at some point given the heterogeneity assumption of the framework. In other words, the heterogeneity assumption removes the requirement for the rarity dimension (El Shafeey & Trott, 2014).

Throughout the 1990s, various approaches were developed which are linked to the RBV such as knowledge management and dynamic capabilities. According to Leonard-Barton (1992), a dynamic capability is: “a firm’s ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments” (Teece, Pisano, & Shuen, 1997, p. 516). According to Teece et al. (1997), the fundamental idea is that it’s merely not sufficient to

solely own or have access to strong resources and capabilities, to achieve sustained competitive advantage a firm must constantly develop and renew its resource base and competencies through the possession of strong dynamic capabilities (Nielsen, 2006).

Teece (2007) developed a framework to create dynamic capabilities which consists of: “sensing opportunities or threats, seizing opportunities and reconfiguring a firms tangible and intangible asset.” Sensing is largely a scanning, learning and interpretative process by which important internal and external information is gathered and assessed. Seizing is largely a decision-making capability aiming to seize (develop) new opportunities given the uncertain and changed environment. Reconfiguring relates to the ability of restructuring assets, strategies and operations (Teece, 2007). A conceptual model concerning the foundations of dynamic capabilities and business performance can be found in Appendix E.

In the context of SCM, the ability of employing successful ambidextrous strategies requires the build-up of dynamic capabilities such as adaptation, flexibility and agility which are key competencies for adapting to uncertain global changes in the business environment. Sensing is equal to supply chain visibility which is defined by the ability to monitor the flow of information in relation to inventory levels (upstream and downstream), demand and supply data, production and purchasing. Due to successful scanning of the supply chain, a focal firm enhances its responsiveness (agility), planning and decision-making capabilities. Seizing is congruent with the agility concept given that supply chain problems should be treated in a timely manner. Within SCM, reconfiguring relates to flexibility in that it involves the restructuring of assets, strategies and operations given the outcome of the sensing and seizing process (Lee & Rha, 2016).



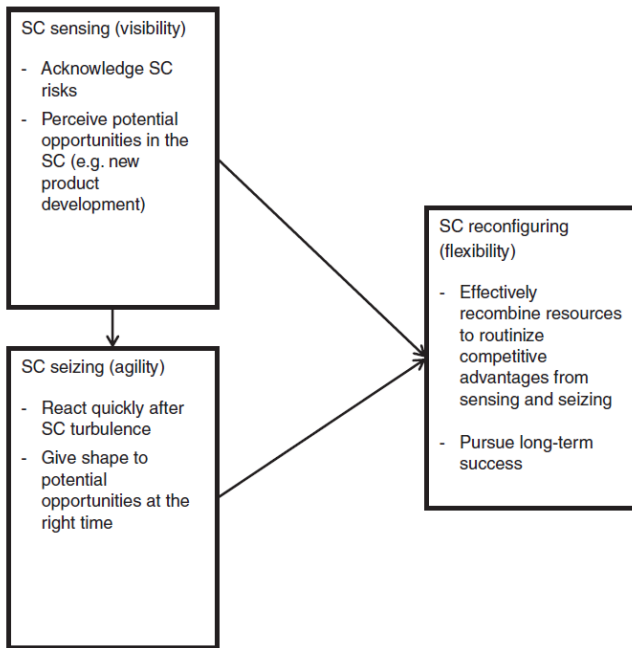


Figure 5: The dynamic SC capability-building process, adapted by (Teece, Pisano, & Shuen, 1997)

## 2.2 Supply Chain Management

Historic events such as the construction of the pyramids in Egypt and the invasion of the Allied Forces in Europe in the second World War have been logistical masterpieces. The fundamental principle of logistics and SCM have changed little throughout time. Christopher (2011) defines logistics as:

*“The process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and the related information flows) through the organization and its marketing channels in such a way that current and future profitability are maximized through the cost-effective fulfilment of orders.”* (Christopher, 2011, p. 2).

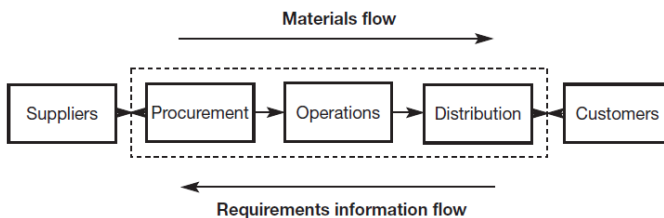


Figure 6: Logistics management process, adapted by (Christopher, 2011)

Aitken (1998) defines a supply chain as: *“a network of connected and interdependent organizations mutually and co-operatively working together to control, manage and improve the flow of materials and information from suppliers to end users.”* (Christopher, 2011, p. 4).

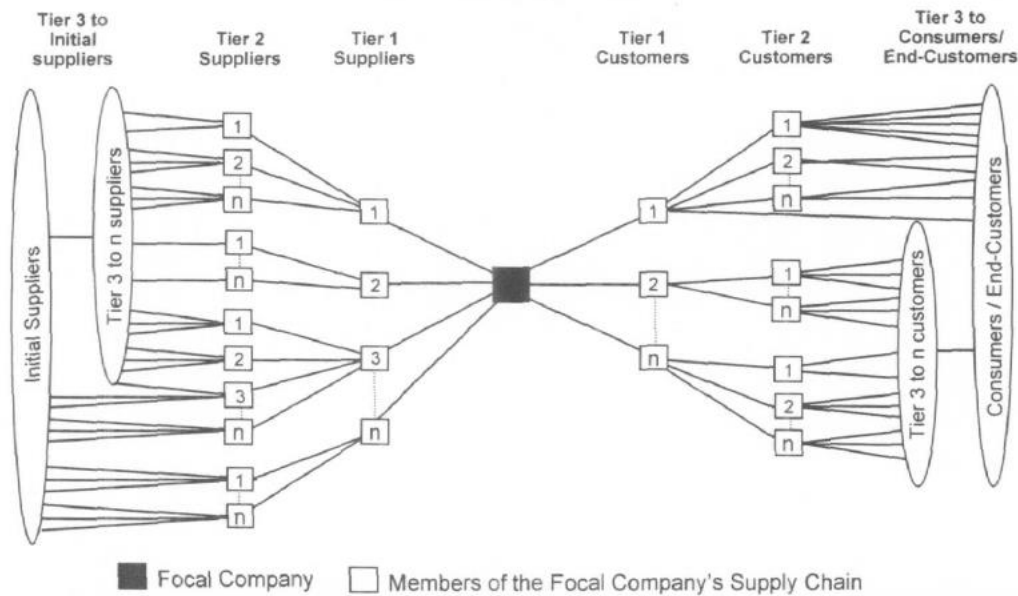


Figure 7: Supply chain network structure, adapted by (Lambert, Cooper, & Pag, 1998)

The Global Supply Chain Forum (GSCF) defines supply chain management as: “*the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders.*” (Lambert, Cooper, & Pag, 1998, p. 1). They further identified eight fundamental processes within the field of SCM (Croxtton, García-Dastugue, Lambert, & Rogers, 2001). Lambert, Cooper and Pag (1996) provide a schematic representation of supply chain management and its business processes (**Appendix F**) (Lambert, Cooper, & Pag, 1998).

Global business operations until 2018, fueled by the reduction of trade barriers, are increasingly becoming borderless resulting in the crucial importance of managing supply chains on a strategic level. Given the complex business environment and increasing market uncertainty, Li et al. (2006) explains that a supply chain versus supply chain competitive focus is increasingly adopted rather than a firm versus firm view (Qrunfleh & Tarafdar, 2013). According to Christopher (2011), the increasing trend to outsourcing leads to companies becoming members of an interconnected and complex network of specialist providers of resources and competencies. The companies which are best in utilizing resources and competencies of partners across the supply chain will likely be most successful in nowadays era of network competition. An emphasis to collective strategy development among network partners is crucial to achieving effective network competition (Christopher, 2011).

Fisher (1997) points out that a mismatch between the product type and supply chain type causes major problems for supply chains and thus developed a framework for managers to plan for the

right supply chain based on demand characteristics of the product. Products are either classified as primarily functional or innovative. A tabular representation of demand characteristics of functional and innovate products, as well as features of physically efficient and market responsive supply chains is to be found in *Appendix G* (Fisher, 1997).

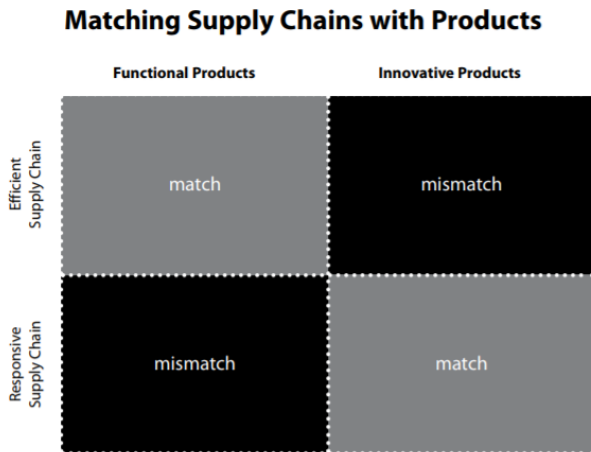


Figure 8: Matching Supply Chains with Products, (Fisher, 1997)

Given the global, complex nature of procurement and the different types of items, firms must develop and adapt purchasing strategies. Kraljic (1983) developed a purchasing matrix with four quadrants based upon two variables namely profit impact and supply risk (low and high) (*Appendix H*). Each quadrant determines purchasing strategies. The idea is to reduce sourcing complexity and increase buyer’s purchasing power (Gangurde & Chavan, 2016). Supply risk can be defined as market-, performance- and complexity risk while profit impact is defined as the impact on profitability and the importance of purchase. Critique to this model is the subjective nature of judgments made by purchasing managers which can lead to faulty outcomes (Wagner, Padi, & Bode, 2013).

Firms are increasing their competitive advantage by viewing SCM as a strategic tool. According to Simchi-Levi et al. (2008), supply chain strategy deals with several adopted approaches with the goal of integrating supply chain members such as suppliers, manufacturers, distributors and stores in a way that goods are produced and distributed in the right quantities, to a defined location and at the right time ultimately reducing system-wide costs and providing the required service level. A fundamental objective of supply chain strategy revolves around the *improvement of responsiveness* of the focal firm in relation to customers (Qrunfleh & Tarafdar, 2013). According to Green et al. (2008), the goal of supply chain strategy is the maximizing of value for end customers by integrating business processes throughout the value chain. Sharma

and Kulkarni (2016) state that supply chain strategies can be either classified as lean, agile or a combination of both namely leagile (Madhani, 2017).

A lean supply chain strategy, arisen out of lean manufacturing and typically following a Make-to-Stock (MTS) replenishment, has its emphasis on cost reduction while an agile supply chain strategy focuses on quick response. Typically, the goal of the lean thinking concept is to remove waste (“muda” in Japanese) across the value chain meaning that non-value adding activities are eliminated. According to Wang et al. (2004), a lean supply chain strategy functions effectively with low product variety and stable, predictable demand characteristics. The focus is on creating cost-efficient supply chains by minimizing inventory lead times and waste. The production of automobiles at Toyota (Toyota Production System) is best known for its lean supply chain strategy as it excels in the elimination of waste in its production environment. Ohno (1988) defines different types of waste namely: “*defects in production, overproduction, inventories, unnecessary processing, unnecessary movement of people, unnecessary transport of goods, waiting by employees*”. Lamming (1999) states that the prime priority of a lean supply chain strategy is to reduce costs, and this can be achieved by following a Just-In-Time (JIT) philosophy and the building of long-lasting relationships with suppliers (Madhani, 2017).

An agile supply chain strategy, origins in flexible manufacturing systems, focuses on speed and flexibility allowing smooth and cost-efficient, rapid reconfiguration due to short-term changes in supply or demand. Typically, the agility concept works best in market environments which are driven by high product demand uncertainty making forecasting difficult. Demand is not measured on a speculative basis, rather a “wait and see” approach is adopted. Goldsby et al. (2006) states that agile supply chains follow a Make-to-Order (MTO) replenishment meaning that products are solely produced when a sale is committed (production on demand) which allows customization opportunities of these products. Referencing Christopher (2000), a prerequisite for agile supply chains is a generic inventory meaning that products are carried in the following forms: “standard, semi-finished products awaiting final assembly”. A key construct of an agile supply chain is flexibility. There is a differentiation between external- and supply network flexibility. Naim et al. (2006) outlines five types of external flexibility namely: “new product, mix, volume, delivery, and access.” Gosling et al. (2010) describes two concepts of supply network flexibility namely vendor- and sourcing flexibility. The concepts of external- and supply network flexibility, as well as determinants of the three mentioned supply chain strategies (lean, agile, leagile) are illustrated in Appendix I and J respectively (Madhani, 2017).

Referencing Aitken (2000), a “leagile” supply chain strategy, a hybrid between lean and agile, can successfully coexist in suitable market environments and proper management. The decoupling point approach to a leagile strategy is characterized by holding strategic inventory, generic or modular, and engaging in final assembly or configuration once customer demands are known. According to Harrison et al. (1999), firms using postponement allows them to adopt lean strategies up to the decoupling point opening opportunities for cost reduction, and agile strategies beyond it where fast response in unpredictable environments is crucial (Madhani, 2017).

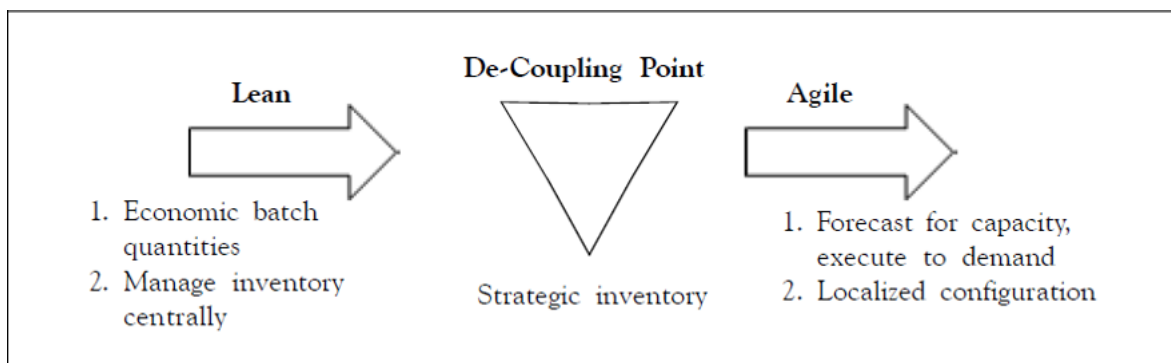


Figure 9: De-coupling point approach in leagile supply chain strategy, (Madhani, 2017)

The concept of supply chain strategy and practices are often dealt with separately and not as an interrelated concept. Furthermore, existing literature fails to provide sufficient information on the bridging of the gap between supply chain strategy and supply chain responsiveness (Qrunfleh & Tarafdar, 2013).

### 2.3 Strategic Supply Chain Management

Strategic SCM includes decision making regarding the overall business strategy and supply chain decisions on a strategic level. Strategic supply chain decisions have a long-term planning horizon (> 1 year) and decisions vary from vertical integration policies, capacity modifications, technology selection, changes in product offerings, outsourcing to opening or closing plants or distribution sites (Sodhi, 2003).

Given rapid market changes and the increasing reduction of trade barriers until today, supply chains become more global, integrated, longer and complex, thus increasing the need for managing supply chains strategically. The driving force of the modern economic world revolves around collaborating regionally and sharing of production internationally to increase the competitive strength of the entire supply chain. The rising need for dynamic capabilities is evident (Masteikas & Čepinskis, 2015).

Qrunfleh and Tarafdar (2013) explored how to overcome the gap between supply chain strategies and supply chain responsiveness. They developed a framework showing the mediating relationships of two supply chain practices (strategic supplier partnerships and postponement) on supply chain responsiveness by using lean and agile strategies. The key is to develop practices which are aligned to the supply chain strategy and relates to supply chain responsiveness. Morash (2001) states the fundamentals of strategy as brought forward by Porter (1996) are defined by the performed activities and thus the fundamental view of supply chain strategy relates to the execution of supply chain practices. Building on the RBV, Qrunfleh and Tarafdar (2013) are viewing the supply chain activities/practices as resources which enable and support the execution of supply chain strategy (Qrunfleh & Tarafdar, 2013).

Thatte, Rao and Ragu-Nathan (2013) assessed the impact of SCM practices on firms supply chain responsiveness and competitiveness. The framework and the definition of the three responsiveness constructs are to be found in **Appendix K**. Supply chain responsiveness is divided into three constructs namely operations system responsiveness, logistics process responsiveness and supplier network responsiveness. Thatte, Rao and Ragu-Nathan (2013) define supply chain responsiveness as: *“the ability of the supply chain to rapidly address changes and requests in the marketplace, which implies that speed and flexibility combined forms responsiveness.”* This framework has limitations and the authors suggest for future research that the impact of specific supply chain practices on one or more sub-constructs of responsiveness should be elaborated. Moreover, only 294 individual respondents (top executives) were surveyed and the framework should be complemented with further constructs to gain in-depth insight of supply chain responsiveness (Thatte, Rao, & Ragu-Nathan, 2013).

Fourie (2006) suggests that the effectiveness of supply chains is a decisive factor which leads to competitive benefits in international markets through the elimination of trade barriers. Supply chain integration yields major benefits as it improves the flow of goods and information in the firm and forms a cohesive functioning unit. There are two broad types of integration namely horizontal and vertical integration (Janvier-James, 2012).

### 3 Research Design

Chapter three is divided into four main sections namely issue restatement, objectives, research methods and analytical tools used for assessing the topic. The third section is further subdivided into seven sections mainly explaining methodological elements such as sampling technique, data collection method, interview preparation process, data analysis methods and data generalizability.

#### 3.1 Restatement of the Issue

Geopolitical pressure resulting from the highly uncertain BREXIT negotiations negatively weigh over the EU-28 automotive industry. Automotive manufacturers such as BMW which have significant UK-EU cross border operations rely on the fundamental benefits of the EU single market and custom union to which the UK is currently part of. The EU guarantees all citizens of any European member state the free movement (see pg. 24). In the event of an unregulated BREXIT, the UK will leave the bloc without any future trading relationship in place and thus falling back to trading rules set out by the WTO with tariffs on components and cars. Considering integrated automotive SC complexity, BMW must identify and assess strategic SCM implications to potentially re-design supply- and production networks to maintain competitive advantage. Relevant decisions include vertical integration policies, capacity sizing, shift of production, facility location, changes in supplier relationships, to name a few.

#### 3.2 Research Objectives and Question

A brief and concise overview of research objectives are the following:

- **Understand the economic consequences (significance) of geopolitical risks** such as BREXIT on an automotive manufacturing company's EU-UK operation:
  - Automotive trade data
  - Movement of people/expertise
  - WTO tariff structure (assumption: unregulated BREXIT)
- **Understand the EU-28 automotive industry:**
  - Market size and growth, competitive landscape
  - Supply chain structure and critical underpinnings, level of SC integration and dependency on tariff free access to EU single market
  - Technological trends and geopolitical situation
- **Analyze the BMW Group's automobile segment:**

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- Organization and corporate strategy (NUMBER ONE> NEXT), value chain
- Supply chain
  - Purchasing and supplier network
  - Production network; relationships, locations
  - SC strategies
  - EU-UK trade data of components and cars
- Strategic decisions; e-MINI production UK, €1 billion investment in production infrastructure in Hungary

Given the research objectives of the case study, the following main search question was formulated:

***In what way can BMW maintain an efficient, responsive and resilient supply chain assuming the realization of an unregulated/hard BREXIT?***

The main educational objective is to provide management students and professors with a well-structured, contemporary “real” business case and corresponding questions. The aim is to provide students with an optimal learning experience by applying Strategic Management- and SCM concepts fostering their assessment- and analytical skills. By solving this case study students will be able to learn and understand the strategic SCM implications which will be the result of the implementation of trade barriers (tariff- and non-tariff barriers) on an automotive MNC with UK-EU operations. In addition, students are required to elaborate on implemented strategic decisions taken by the MNC to prepare for this unregulated BREXIT situation. Students are required to reflect on these decisions, but also propose feasible strategic options.

### **3.3 Research Methods**

This case study is qualitative and explorative in nature, but entails quantitative elements, especially regarding market- and economic trade data. A deductive approach has been used in which the causal relationship between an unregulated BREXIT scenario and strategic SCM implications within the automotive sector was elaborated. The deductive reasoning can be explained by the authors assumption or expectation that an unregulated BREXIT negatively affects supply chain operations from automotive MNC’s with significant EU-UK operations. Existing strategy and SCM theory have been used to assess BREXIT implications. In other words, a focus from the general level to the more specific level characterized the research process.



A conceptual model illustrating research constructs, independent- and dependent variables can be found in *Appendix L*.

### 3.3.1 Population and Sample

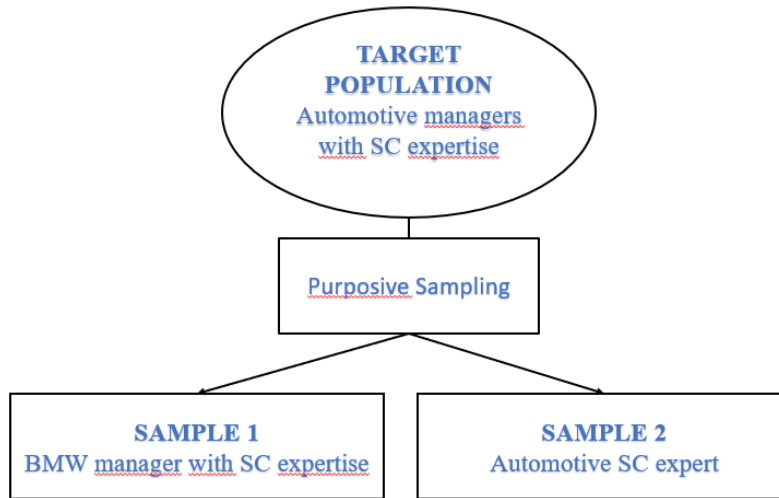


Figure 10: Population and sample

Considering the qualitative nature of the study, the sampling technique for both samples is referred to as purposive sampling. The reason is the ability of the samples to provide expert knowledge regarding BREXIT and SCM implications in the automotive sector.

### 3.3.2 Data Collection

To gain initial insight from professionals in different industries regarding BREXIT implications on industrial enterprises – aside from reading newspapers such as BBC, FAZ, The Guardian –, the author attended a “*BREXIT seminar*” hosted by the German-Australian-Pacific-Lawyers-Association (GAPLA) in Frankfurt, Germany. Informal discussions have been held with the primary purpose of assessing the feasibility of the chosen research idea. Moreover, the author conducted preliminary research to refine project ideas and topic.

The data collection process was separated into:

- a) **Data for the literature review:** strategy, SCM and strategic SCM;
- b) **Data for the three constructs:** economic consequences, automotive industry, BMW.

Data for the literature review was solely collected from secondary sources. Precisely, data was primarily collected from reputed and refereed academic journals such as *The Journal of Management Studies*, *The IUP Journal of Business Strategy*, *The International Journal of Logistics Management*, *Harvard Business Review*. The journals were accessed via scientific databases such as *Emerald Insight*, *Elsevier’s Science Direct*, *ProQuest (ABI/INFORM)* and

*Google Scholar*. Two academic books were used namely *Contemporary Strategy Analysis* from Grant (2016) and *Logistics and Supply Chain Management* from Christopher (2011). Keywords for the literature search were *strategy*, *supply chain management*, *strategic supply chain management*, *supply chain strategies* and *supply chain responsiveness*.

Data for the constructs was largely collected from secondary sources, but primary sources were used too, especially regarding data collected on BMW and automotive market data. Economic data/consequences were retrieved from organizational and professional websites such as the *European Commission*, *Kommerskollegium – National Board of Trade Sweden* and the *European Automobile Manufacturers Association (ACEA)* to name a few. Regarding automotive industry data, industry specific reports and websites have been used such as *PA Knowledge Limited*, *BMW*, *ACEA* and *The Society of Motor Manufacturers and Traders (SMMT)*. Data on BMW was largely retrieved from their website. Annual reports 2016 and 2017, quarterly reports 2018 (Q1 and Q2) and the sustainable value report 2017 provided relevant information for describing the case.

### **3.3.3 Interview Preparation**

Two interviews have been prepared; one with the BMW UK Aftersales Director and the other with an automotive industry consultant. Interview preparation commenced by skimming the authors own network with the aim of increasing the chances to successfully obtain willing respondents. The professional network LinkedIn was primarily used for the skimming process and three contacts have been found useful who either work at BMW or work for firms providing consulting services to the automotive industry. The interviewer asked the respondents about the preferred option of answering the questionnaire and both preferred written over telephone. Both sets of the answered interview questions can be found in *Appendix M*.

### **Interview with BMW**

The fact that the author did not conduct an internship at BMW, collection of specific company data was difficult, especially given the strategic nature of the topic. Natalie Sauber, Senior Strategic Opportunities Manager at the Consultancy Arcadis NV, successfully mediated a suitable contact, the Aftersales Director, Richard Price, at BMW UK. Correspondence between the interviewer and interviewee was conducted via E-Mail. The purpose of this interview was to complement the extensive secondary data which is available online. Specifically, the interviewer aimed at receiving data concerning SC practices, strategies and supplier

relationship management considering BREXIT. Moreover, the author aimed at receiving more insight into the strategic decisions conducted by BMW.

### **Interview with an automotive SC expert**

The interview with Simon Clark, Principal – Technology and Innovation Management at the Consultancy firm Arthur D. Little, was likewise successfully mediated by Natalie Sauber. The interviewee has a long history as an automotive consultant and has so far worked with Jaguar, Land Rover, Renault, Aston Martin and McLaren. He has managed projects from setting up a factory in China to helping premium OEM's to reduce lead time for customers and increase cash flow by making sure the right vehicles were at the right place at the right time. Correspondence was conducted solely via E-Mail. The purpose of this interview was to gain insight on potential strategic measures, SC practices and BREXIT implications on the UK automotive sector.

#### **3.3.4 Interviewing Process**

Qualitative written interviews with open questions were conducted and submitted via E-Mail to both respondents. Regarding the interview conducted by Richard Price, BMW UK, the condition was that his responses will solely be used for developing the thesis and that his name will not appear in public in any way. This permission regarding confidentiality has been given in writing via E-Mail.

#### **3.3.5 Primary Data Analysis**

The content of collected primary data from the interviews was analyzed through systematic categorization by retrieving relevant elements.

### **BMW interview**

<b>Main question elements</b>	<b>Retrieved answer elements</b>
1. Major strategic SCM implications	Component flow disruption, third country import flow disruption, renegotiation or replication of trade agreements, duties, tariffs, customs clearance formalities, vehicle supply line disruption, entry port congestion, general cargo bottlenecks, prolonged lead times

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2. Ensuring transfer of expert knowledge	Additional admin burden, preparation of additional formalities
3. Strategic supplier partnerships and implementations	Re-organization of supplier logistics & routing arrangements
4. Supplier preparation process of BREXIT task force	Ensuring business continuity, optimization of supply lines, work streams/packages BMW UK and BMW AG perspective, consolidation of SC individualities, congruence
5. Flexibility of supply network in UK	Large, sophisticated, fixed term contracts, strategic break points, reviews, difficult to change vendors
6. Supplier ability rating, improvement	Pipeline visibility of stock, earlier supply, greater stock holding
7. Vertical integration policies, safeguarding supply of strategic components	Strategic joint ventures, exclusive supply contracts
8. BREXIT impact JIT	No comment
9. Ability MINI components sourced in UK	Factors of production abundantly present, broadening of manufacturing base post BREXIT, establishment of domestic manufacture & supply arrangements
10. Feasibility of re-location of MINI production to continental Europe	Feasible, investment in model specific manufacturing infrastructure, UK biggest market & spiritual home, long-term commitment
11. Elaboration BMW decision, fully electric MINI production in Oxford, UK	No comment
12. Future of BMW UK operation, maneuver capability	UK fourth biggest market, significant manufacturing presence

Table 1: Analysis of BMW interview responses

**Automotive SCM expert interview**

<b>Main question elements</b>	<b>Retrieved answer elements</b>
1. Major strategic SCM implications	Increase in component import and export costs, slower component flow, time issue, production time impact, higher vehicle costs, increasing local procurement, operations move to Europe, increasing prices for customers, tier 1 & 2 suppliers business continuity issues
2. Ensuring transfer of expert knowledge	Collaboration opportunities digital age, increasing complexity of physical transfer of expertise
3. Key strategic measures	Monitor supplier health, identify and monitor critical components, measure movement of talent, gather employee insight
4. Evaluation of BREXIT task force	Assessment of valuable components, key supplier assessment, financial health, track record
5. Vertical integration policies, safeguarding supply of strategic components	Expect increasing level, tier 1, 2 & 3 suppliers
6. BREXIT impact JIT, key SC practices ensuring efficiency and responsiveness	Understand customer preferences, inventory management/transparency, fast-moving items & slow-moving items
7. Role strategic supplier partnerships	Crucial importance, openness, transparency
8. Elaboration BMW decision, fully electric MINI production in Oxford, UK	Long British history, heavy investments
9. Future of BMW UK operations	no relevant answer
10. UK governmental incentives	Possible given the importance of the automotive sector

Table 2: Analysis of SC expert interview responses

### **3.3.6 Secondary Data Analysis**

Analysis of secondary data in relation to the case description and resolution of questions commenced by locating relevant data. The relevancy of the data was evaluated in a second step by skimming portions of the text. In a third step, the credibility of the organization or author was assessed to avoid the collection of faulty or overly biased information. If deemed relevant and credible, the content was thoroughly analyzed by carefully reading and highlighting essential information which was useful for describing and answering the case. This four-step approach has been adopted with all secondary data.

### **3.3.7 Validity and Generalizability**

Given the qualitative nature of the study, validity relates to the level of appropriateness of the search questions, frameworks, data collection and analysis processes. The goal is to develop a cohesive thesis which is appropriate and relates to the various parts. Broadly speaking, the case study mainly deals with assessing ways for BMW to maintain a responsive SC in a post BREXIT scenario. Therefore, the first action taken was to understand the economic consequences (tariff and non-tariff barriers) of an unregulated BREXIT and its impact on BMW's SC operations. To gather valid data, the concept of data triangulation was adopted in the sense that many different types of data sources were used to avoid overly biased information. In a second step, the EU-28 automotive sector was analyzed to assess the BREXIT significance. In a third step, BMW's auto-segment was closely analyzed to better understand the BREXIT impact, especially focusing on BMW's UK and continental Europe SC operations.

A crucial topic of the thesis is the concept of SC strategies, practices and responsiveness which is reflected in the interview questions and the case questions and relates to the main research question. To receive valid and appropriate primary data, a written interview with a BMW Director was conducted. It should be mentioned that the interviewee has gained extensive company know-how in different departments through his 20-year career at BMW UK and therefore is well suited to provide relevant answers. To receive more valid data for assessing the BREXIT phenomenon, the author made use of triangulation and conducted a second interview. Additionally, various secondary sources were used to assess the topic.

Regarding generalizability, one must differentiate between the type of data. For example, the gathered economic data regarding the trade relationship between the UK and EU in an unregulated post-BREXIT situation is generalizable as it deals with the regulatory framework and is applicable to every organization with cross-border operations. BMW data, especially

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regarding SC practices (strategic supplier relationships, activities e.g. BREXIT task force) and strategic production decisions taken, cannot be generalized to the whole automotive sector since too much company specific data plays a role which cannot be portrayed to another automotive company (Leung, 2015).

## **4 Research Findings**

The research findings are based on the actual case study description and the resolution of the case questions. The last chapter represents a list of material which was used to answer the questions.

### **4.1 Case Data**

#### **The importance of free trade and anti-European sentiment**

A fundamental pillar of the world trade system revolves around preferential trade agreements between states. Economists commonly agree on the benefits it provides such as trade stimulation and the overall growth effects between members of a trade partnership. Although in recent years, world trade has suffered significant shocks and disintegration policies are causing “headaches” for MNC’s. Known examples are the withdrawal of the US from the Trans-Pacific Partnership (TPP) and the leave of the UK from the EU by March 29, 2019 (Gonzalez, 2018).

Separatist movements and anti-European sentiment among the public and political parties within European countries such as France (Marine Le Pen’s Rassemblement National), Netherlands (Geert Wilder’s Partij voor de Vrijheid) and Germany (Alexander Gauland’s Alternative für Deutschland) gained traction in recent years which can provide businesses with “headaches” given the high level of uncertainty. It is commonly known that a certain level of danger and risk is attached to uncertain situations in the business environment. The current and highly uncertain BREXIT situation provides firms, especially with UK and EU operations, with significant challenges in relation to long-term business planning, strategy formulation and SCM.

#### **4.1.1 Economic Consequences of an Unregulated BREXIT**

##### **Political information and assumptions**

The political stance of the current governing Conservative Party and the ineffective and sluggish negotiations strongly point towards the realization of a hard BREXIT taking effect on March 29, 2019. This means the UK would leave the EU single market, as well as the customs union (PwC, 2016). A hard BREXIT assumes firstly that the UK is not able to successfully negotiate a trade relationship with the EU by March 2019 given its complexity and lengthy



process and thus the trading rules of the World Trade Organization (WTO) would take effect. Secondly, this case assumes that no transitional phase will be realized after March 29, 2019.

A crucial foundation of the EU are the four freedoms which are characterized by the free movement of goods, services, capital and people. An unregulated BREXIT drastically affects the four freedoms and has severe business and management implications for all industries with cross border operations between the UK and EU given the implementation of trade barriers such as tariffs, custom charges, admin costs and quotas (Kommerskollegium, 2015). In addition, the harmonized VAT system would not cover the UK anymore. Standard and Poor's (S&P) acknowledge the risks and threats of increased tariffs and state that these are "challenging" hurdles for global SC's. They state that any type of trade restriction would be devastating for automotive manufacturers, especially for cars produced in the UK given their relatively high dependency of imported parts from mainland EU (S&P Financial Services LLC, 2017). Firms with significant UK-EU operations are assessing possibilities to re-locate operations to the EU (BMW Group, 2017).

#### **Automotive trade figures between the UK and EU in 2017**

The UK represents a crucial part of the automotive SC with 30 production facilities of major automotive manufacturers producing engines and vehicles. 80% of automobiles produced in the UK were exported; of which 54% (800,000 vehicles) were destined for EU member states. A value of € 11.4 billion in components (14.1 million parts) were imported by the UK from the EU-27 countries. This share represents 78.8% of global component imports by the UK. On the other side of the spectrum, the EU-27 countries manufactured 16.69 million vehicles of which 11.7% (2.3 million) were destined for the UK. The EU-27 countries imported components with a value of €4 billion (21.7 million parts) representing 68.3% of UK's global component exports (ACEA, 2018). For a graphical representation regarding import and export volumes between the UK and six major EU member partners, please see *Appendix N*.

#### **Movement of skilled labor/expertise between the UK and EU automotive sector**

The free movement of talent (UK and non-UK) between different sites within the EU is crucial for the automotive sector. The UK automotive industry employs about 814,000 people and a significant share is filled by non-UK EU workers. Peaks in demand, production line faults or traineeship programs are causes for employees to travel between EU countries on short notice. Any regulatory changes to the free movement of labour causes business planning challenges and increases costs (SMMT, 2017). Mike Hawes, Chief Executive from SMMT reinforced the

importance of free movement of skilled labour in the automotive sector by stating: “*They [carmakers] can’t get enough people. It’s not about replacing British jobs, it’s about supplementing those we can’t fill,*” said Hawes (Guardian News and Media Limited, 2016).

### Impact of tariff barriers and WTO tariff structure

Table 1 gives insight into the tariff structure according to WTO trading arrangements between the UK and EU given a hard BREXIT.

Table 3: WTO trading arrangement, (PA Knowledge Limited, 2017)

Type of goods	WTO duty on UK exports to EU and vice versa
Finished Goods e.g. cars	10%
Components e.g. drivetrain, engine parts	4.5%
<b>Additional information</b>	
Components make up 50% of the car value	
UK component imports from EU equals 60%	
Profit margins of carmakers 2% - 4%	

As of today (pre-BREXIT), 95% of UK car imports are tariff-free benefiting consumers in terms of lower prices. According to Mike Hawes, the additional tariffs will most likely be passed on to consumers (House of Commons, 2017).

### Impact of non-tariff barriers

UK automotive manufacturers will be facing non-tariff barriers given increased border checks and delays, custom handling procedures and more bureaucracy e.g. associated to complex VAT tax procedures, import clearance procedures. Cost minimization and efficiency maximization are critical to the JIT delivery system. UK automotive warehouses typically hold inventory for only one day given the transportation reliability between the UK and EU. To put this in perspective, UK warehouses hold inventory from Japanese suppliers for two – three weeks given increased delays (House of Commons, 2018).

#### 4.1.2 EU-28 Automotive Industry

The EU-28 automotive industry is characterized by deep integration in terms of economic, regulatory and technical aspects. Major Western EU countries producing passenger cars are

Germany, France, Italy, Spain and the UK while Central EU countries are Romania, Hungary and Poland (ACEA, 2018). Bad publicity related to the VW diesel scandal regarding software manipulation negatively weighed over the industry in 2017. This fueled political discussions, especially in the UK and Germany (BMW Group, 2017). Today, key disruptive trends such as electrification, autonomous driving and mobility services are shaping the industry environment due to rapid technological developments, sustainability policies and changing consumer preferences.

### **Market size & growth**

Sales volume, production and growth data refer to Quarter 1 results of 2018. The EU global automotive market share measured by sales volume of passenger cars ( $\approx$  4.2 million cars) amounts to 21%, capturing the second rank behind China. In terms of production of passenger cars ( $\approx$  4.3 million cars), the EU is the second largest automotive producer after China with 21.6% global output (ACEA, 2018).

The EU's demand for new passenger cars measured by car registrations (sales volume) experienced a moderate growth rate of 0.7%. A significant drop in demand was experienced in the UK amounting to a sales decrease of 12.4%. Major reasons are linked to the uncertain outcome of the BREXIT negotiations and lower real salaries due to the depreciation of the British Pound. Conversely, the demand for new cars in Spain, Germany and France grew by 10.5%, 4.0% and 2.9% respectively (ACEA, 2018).

### **Technological trends and the “new” competitive landscape**

Electrification is regarded as the most pressing mega trend shaping the industry in the coming years. Increasing battery efficiency, tighter emission regulations, increasing amount of charging stations and growing consumer demand for electrified vehicles will likely stimulate adoption rates. The consultancy, McKinsey, estimates a global share of electrified vehicles between 10%-50% based on new vehicle sales by 2030. The oligopolistic competitive landscape is increasingly shaped by mobility service providers such as Uber, specialty OEM's like Tesla and tech giants like Apple and Google. It is expected that many tech companies will enter the market requiring traditional OEM's to adapt their business model (Gao, Kaas, Mohr, Wee, & Möller, 2016). Moreover, the market is challenged by price pressures, reduction in delivery time, quality, customer service improvement, shorter product life cycles, faster introductions of new products, reduction in time to market, and the strengthening of relationships (Ambe & Badenhorst-Weiss, 2010). See *Appendix O*.

The UK automotive market is highly competitive with a major share of car production destined for the European market. The industry is characterized by high production volumes and relatively low profit margins. Thanks to the single market and customs union, competitive prices can be offered to consumers (House of Commons, 2018). Given the trend towards electrification, UK's Secretary of State for Business, Energy and Industrial Strategy, Greg Clark, confirmed the set-up of a £80 million state-of-the-art battery facility producing electric batteries for the automotive sector (Mullen, 2018).

### **Automotive supply chains and its critical underpinnings**

Automotive SC's are undoubtedly one of the most complex in the world. Until a vehicle is completely built, OEM's source about 20,000 parts from thousands of suppliers in different geographical areas (Kapadia, 2018). Traditionally, the automotive industry followed a "push" system meaning that marketing and sales forecasts determined production volumes. The prime focus was on mass production by adopting lean JIT manufacturing processes and using supporting technologies such as Enterprise Resource Planning (ERP). With increasingly rapid changes in the market environment and customer preferences, companies are required to adopt a more customized approach to planning production referred to as the "pull" system. Here, specific customer orders determine the production of products in a timely manner to avoid costly stockpiling of parts. The entire assembly process relies on sequential JIT delivery of components between Tier 1- and Tier 2 suppliers, and Tier 1 suppliers and OEM's (Ambe & Badenhorst-Weiss, 2010). The UK automotive industry is highly integrated and intrinsically connected with the EU. In fact, UK automotive manufacturers are linked to complex supply networks of Tier 1 and Tier 2 component manufacturers, logistics providers, wholesalers and dealers in more than 100 countries globally. (PA Knowledge Limited, 2017).

#### **4.1.3 BMW**

##### **Organization and Business Model**

Initially founded as Bayerische Flugzeugwerke Aktiengesellschaft (BFW AG) in 1916 and becoming Bayerische Motoren Werke Aktiengesellschaft (BMW AG) 2 years later, the company is headquartered in Munich, Germany. BMW AG is the mother entity of the BMW Group of which it is wholly responsible in terms of control and respective management. The company primarily manufactures and sells engines, vehicles, accessories, but also renders services related to its various business segments. It is one of the German leading automotive manufacturers operating on a global scale spanning 150 countries. The company employs a

workforce of 129,932 of which 90.5% is employed in the automotive segment as of the 2017 reporting period. The BMW Group can be categorized in to 4 segments namely Automotive, Motorcycles, Financial Services and Other Entities segment (BMW Group, 2017).

Regarding the production of automobiles and motorcycles – major revenue source -, BMW operates 31 production and assembly sites in 14 countries, the majority being in Germany. In addition, distribution is managed by around 6000 dealerships in over 150 countries. Concerning the financial services segment, the BMW Group is represented in over 150 countries. (BMW Group, 2017).

### **Corporate Strategy and Management**

Being one of the most successful automobile and motorcycle manufacturers on a global scale, the company is unique in positioning its three brands – BMW, MINI, Rolls Royce - exclusively in the premium segment. BMW established production networks in the Americas and Asia fostering their “production follows the market” strategy for existing models. Moreover, the company constantly innovates to be able to sell new models to well established markets. BMW’s vision is to be number one by shaping tomorrow’s individual premium mobility and inspiring people on the move. Competitive advantage is gained by (BMW Group, 2018):

- Uniquely understanding customers desires through ongoing and direct dialogue;
- Offering the most aspirational brands and experience in the most innovative and emotional manner;
- Constantly developing innovative and future technologies for products and services;
- Inspiring employees, customers and partners by following a philosophy guided by respect and integrity;
- Being flexible and engaging in continuous optimization of value chains.

In 2016, the company has outlined its strategy NUMBER ONE >NEXT which focuses on technological development and digital connectivity while fostering a culture of sustainable mobility. The BMW Group emphasizes its research in electric mobility, as well as automated driving and has so far successfully sold over 50,000 vehicles of the BMW i brand. Harald Krüger, CEO of the BMW AG, stated: “*BMW iNEXT heralds the next era of mobility. This symbol of our technology leadership will demonstrate how we will bring the future of mobility into series production.*” As a technological trendsetter, the company’s third generation plug-in hybrid models are market leaders and ongoing Research and Development (R&D) is dedicated to electrification of its product range. Furthermore, the company dedicates R&D towards

hydrogen fuel-cell technology enabling long driving ranges with zero emissions (BMW Group, 2018).

Management of the BMW Group's business segments are closely tied to corporate governance principles which are linked to sustainable value creation. To successfully adhere to these principles, BMW's management system clearly outlines accountability measures which are backed by incentive programs, control systems and guidelines (BMW Group, 2017).

### **Value Chain**

The rapid technological advancements in digital mobility results in major value chain transformations resulting in automobiles becoming increasingly connected with the mobility world. BMW will continue to focus its primary activities on developing, producing and selling vehicles, but its current product portfolio will be complemented with mobility services. The company's main business drivers revolve around *automation, connectivity, electrification* and *sharing*. Please refer to **Appendix P** for an illustration of the company's value chain.

BMW's value creation and continued growth is largely achieved through the flexible and global production network. To be able to manufacture cars with different drivetrains (combustion engine, electric- and hybrid vehicles) in the same production plant, BMW will make use of scalable modular electric construction kits by 2020.

### **Automobile Business**

Important automobile markets measured by the percentage of deliveries in 2017 have been China (24.2%), USA (14.4%), Germany (12.0%) and the UK (9.8%) (BMW Group, 2017). In the first two quarters of 2018, BMW's automotive segment delivered a total of 1.242 million cars and produced a volume of 1.316 million cars. Respective revenues amounted to 41.518 billion Euros. Automobile sales in Europe for the sixth-month period in 2018 amounted to 562,102 units. Due to BREXIT uncertainty, automobile sales decreased in the UK by 1% and reached 124,294 units in the first 6 months of 2018 instead of 125,544 units in 2017 (BMW Group, 2018).

## Strategic SCM Implications of an unregulated BREXIT – A Case Study

Table 4: BMW automobile deliveries by geographical region, (BMW Group, 2018)

Automotive segment deliveries of vehicles by region and market						
→ 11						
in units	2nd quarter 2018	2nd quarter 2017	Change in %	1 January to 30 June 2018	1 January to 30 June 2017	Change in %
Europe	291,377	287,210	1.5	562,102	555,206	1.2
thereof Germany	81,424	76,982	5.8	149,718	144,414	3.7
thereof UK	63,013	62,540	0.8	124,294	125,544	-1.0
Americas	119,713	115,292	3.8	226,061	217,530	3.9
thereof USA	91,940	89,616	2.6	176,570	171,785	2.8
Asia	211,197 <sup>1</sup>	215,748 <sup>1</sup>	-2.1	423,890 <sup>2</sup>	415,888 <sup>2</sup>	1.9
thereof China	147,059 <sup>1</sup>	150,614 <sup>1</sup>	-2.4	300,153 <sup>2</sup>	293,572 <sup>2</sup>	2.2
Other markets	15,591	15,332	1.7	30,454	32,195	-5.4
<b>Total</b>	<b>637,878<sup>1</sup></b>	<b>633,582<sup>1</sup></b>	<b>0.7</b>	<b>1,242,507<sup>2</sup></b>	<b>1,220,819<sup>2</sup></b>	<b>1.8</b>

<sup>1</sup> Including the joint venture BMW Brilliance Automotive Ltd., Shenyang (2018: 106,944 units, 2017: 96,794 units).

<sup>2</sup> Including the joint venture BMW Brilliance Automotive Ltd., Shenyang (2018: 215,218 units, 2017: 186,966 units).

### *MINI brand*

The UK is the spiritual home of the brand with a long British history. In the 1950s, the first MINI Cooper was developed, and it became one of the most iconic cars in the 1960s. Throughout the 1970s and 1980s, the future of MINI was somewhat uncertain given the sale of license rights to Italian and Spanish companies. In the 1990s, the BMW Group acquired the Rover Group including the rights to the MINI brand and in 2000 the company decided to re-launch the brand (Boeriu, 2012).

From 2000 - 2012, the BMW Group invested about £1.75 billion in its “production triangle” which is formed by the assembly plant in Oxford, manufacturing of body pressing and sub-assembly parts in the Swindon plant and the engine plant in Hams Hall (The Guardian, 2012). Investments between 2014-2015 amounted to £750 million and revolved around the upgrade of the production triangle with respect to robot technology, new vehicle platforms, body manufacturing technology, quality validation processes to name a few. The new platform design adds greater flexibility to the body manufacturing process. In this way, greater efficiency of the MINI built-to-order production strategy is achieved. Production expertise for the (BMW Group, 2013).

Various models of the MINI are currently produced in Oxford, UK, and at the contract manufacturer VDL Nedcar in Born, Netherlands. In Oxford, MINI Hatch models (3-door and 5-door), the Clubman and the John Cooper Works are produced, and the Dutch site produces MINI Hatch models (3-door and 5-door), the Countryman and the Convertible (BMW Group, 2017). The workforce at the Dutch site has increased by roughly 2,700 workers totaling 7,200

in 2018. Production capacity has significantly risen as well. In comparison, employee levels at the Oxford plant remained unchanged at 4,500 workers and a daily production capacity of 1,000 MINIS is achieved (Young & Taylor, 2018).

The BMW Group decided to produce a fully electric MINI in Oxford, UK, whereby the electrical drivetrain is developed in Germany (Dingolfing and Landshut) and transported to the Oxford plant for final integration. Production of the fully electric MINI 3-door is expected to commence in 2019 (BMW Group, 2017).

### **Purchasing and Supplier Network**

BMW's global supplier network is critical to the overall performance of the company as suppliers are responsible for a significant share of innovation, quality and value creation. BMW sources automotive parts from 12,000 suppliers in 70 countries. The company primarily sources production material from Germany (37.6%), Eastern Europe (21.5%) and Rest of Western Europe (17.7%). Given the global orientation of BMW's supplier network, prime activities relate to the sustainable procurement of raw materials and production materials, as well as respective quality assurance. Supplier selection is based on quality, innovation, flexibility and cost. BMW strictly respects and commits itself to international accepted guidelines and principles and expects from its suppliers and their suppliers to align their due diligence process with the "UN Guiding Principles on Business and Human Rights" (BMW Group, 2017).

BMW sources principal parts and components from about 40 major suppliers such as Thyssen Krupp, Bridgestone, Brembo and BorgWarner. The supplier working relations index conducted annually by Planning Perspectives Inc. assesses the perception of suppliers regarding their relationships with OEM's. The index is based on 5 main areas namely *OEM Supplier Relationship*, *OEM Communication*, *OEM Help*, *OEM Hindrance* and *Supplier Profit Opportunity*. Each main area includes 2 – 3 variables and the final score is calculated based on the weighted average of all the variables and represented in a Likert type scale (Planning Perspectives Inc., 2018).



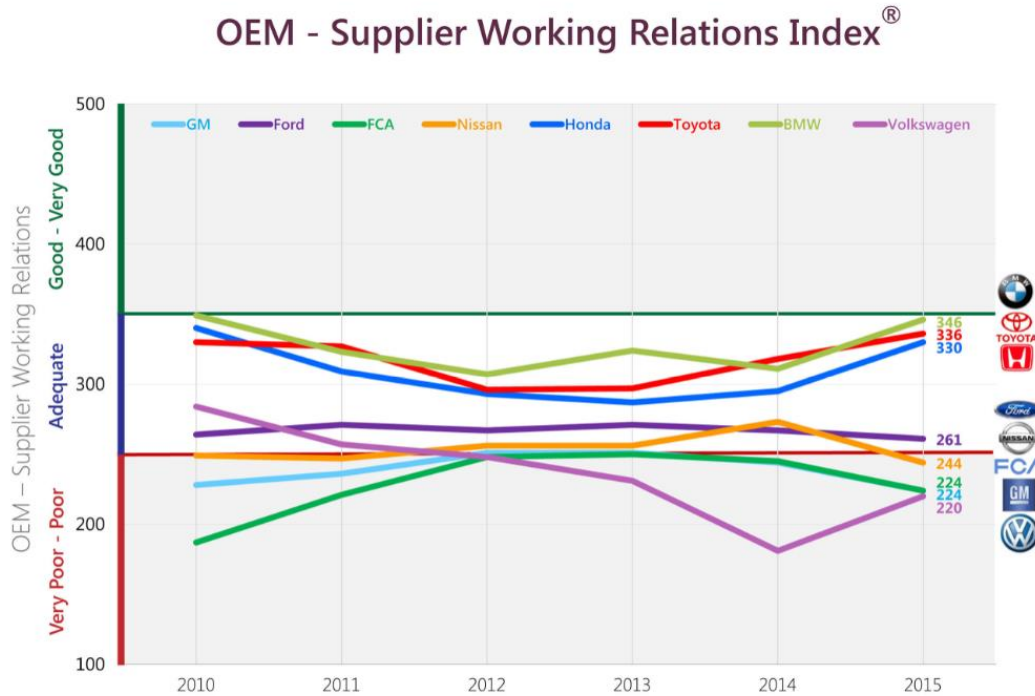


Figure 11: OEM - Supplier Working Relations Index, (PR Newswire, 2015)

In 2015, BMW increased their supplier relations in the area’s *Hindrance*, *Communication* and *Supplier Profit Opportunity*, but supplier perception decreased in the field *Help* suggesting room for improvement in terms of helping suppliers to reduce costs and improve quality (PR Newswire, 2015). In 2018, the Chinese battery manufacturer Contemporary Amperex Technology Ltd. (CATL) decided to enter the European market by developing an Electro-Vehicle (EV) battery production plant in Erfurt, Germany with first phase investment amounting to €240 million. The largest battery producer for EV’s intends to supply all European OEM’s and landed a major contract with BMW (Preisinger & Bryan, 2018). Currently, BMW sources its EV batteries from Samsung SDI, but to secure long-term supply of EV batteries the new supply contract with CATL exceeds €1 billion (Lambert, 2018).

## **Production Network and Competence**

The European production network is undoubtedly the most important for the BMW Group and accounted for a significant share of all vehicle sales of 45% in 2017. The network consists of BMW Group plants, joint operations and contract plants.

In Germany, the network consists of 8 group plants which primarily manufacture various BMW models, drivetrain components, components for electric mobility, petrol and diesel engines. A joint operation in Germany with SGL Automotive produces carbon fibre fabrics. In the UK, the BMW Group operates 4 sites which focus on the production of MINI models, petrol engines for BMW automobiles, plug-in hybrid engines for the BMW i8, pressed parts, bodywork components and 4 models of Rolls Royce. In Austria, the network spans one group plant which produces petrol and diesel engines for BMW and MINI, core engine parts and high-performance engines for M models. Specific contract production for the BMW 5 Series Sedan takes place in Graz, Austria. In the Netherlands, various MINI models and the BMW X1 is produced by the contract manufacturer VDL Nedcar (BMW Group, 2017).

In 2018, the company invested €1 billion in a new production site near Debrecen, Hungary, with an annual production capacity of 150,000 vehicles. To this point, it is unclear which models are going to be produced, although BMW mentioned that the production competence will revolve around combustion and electrified vehicles. Moreover, BMW invests a further € 1 billion in its German sites to upgrade and prepare for electrification (BMW Group, 2018).

BMW's production competence revolves around flexibility, quality and adaptability. The production system is highly efficient and robust and is critical to gaining a sustained competitive edge. Standardized module production, digitalization and a high level of customization adds value to the production system. To reduce product complexity and increase the flexibility of the production processes, BMW standardizes basic modules. This means standardized basic components are used in different types of automobiles resulting in an overall decrease of development costs. The standardization of components and modules through innovative production architecture and the usage of the platform concept throughout the entire production network enables BMW to achieve production benefits (Shiu, Bonacina, & Binninger, 2017).

The BMW Group plants in the German cities Dingolfing and Landshut play a leading role as competence centers regarding electric mobility. The Leipzig plant demonstrates exceptional competence in energy generation via on-site wind turbines, battery, sustainable use of energy use and battery storage. The Eisenach plant specialized in the production of aluminum, stainless

steel outer body parts for the Rollys-Royce plant in the UK. The manufacturing of electrical drivetrains and electric motors is spread around various locations, but the plants in Dingolfing and Landshut play a crucial role (BMW Group, 2017).

### **Supply Chain Strategies and Practices**

In 2001, BMW developed its influential “*KOPV*” *Customer Orientated Production and Sales System* which has exerted great influence in automotive built-to-order (BTO) production processes (Wheatley, 2013). This production process allows customers to have some form of customized products built into their “personalized” vehicle. Major benefits of the BTO production strategy are:

- Increased planning certainty for suppliers and BMW;
- Increased reliability of component and parts deliveries resulting in smaller required inventory levels;
- Optimized production costs due to better planning;
- Increased reliability of suppliers’ sequence deliveries.

To optimally serve major markets such as North America, South America, Europe and Asia, the BMW Group adopts their so called “*production follows the market*” strategy in which vehicles are locally produced and thereby minimizing the risks of increasing trade barriers, especially given a growing number of trade disputes (BMW Group, 2017). This strategy allows BMW to produce regionally and optimally serve the different markets.

For example, with respect to the recent trade dispute between USA and China, BMW made a strategic decision regarding the production location of the BMW X3 model. Initially BMW has produced this model in the USA and shipped it to China where it is being sold. Although the company decided it is more feasible to produce this model in China, thus eliminating existing tariffs and any additional tariffs arising from this dispute (Reuters, 2018).

BMW’s SCM team have developed a social software assessment tool (Enterprise 2.0) analyzing unstructured information from various internal and external sources (social network sites, blogs, forums etc.) to aid in SC planning by increasing the visibility of the supply chain. The software uses a self-learning algorithm which aggregates and analyzes actual information instantly therefore helping with daily decision making. BMW employees use a tablet and respective application to access the gathered “structured” data. Information sharing, and collaboration opportunities are fostered given the increasing level of transparency. Geo-tagging of

manufacturing sites and supplier locations provide a visual map of the location of potential threats (University of Waterloo, 2015).

Given the increasing BREXIT uncertainty, BMW organized several supplier events in Oxford and Munich with the purpose of training its suppliers about custom clearance procedures given that a majority solely operate within the EU and thus were not confronted with import and export declarations up to this point (Wiggins, 2018).

## 4.2 Resolution of Case Questions

### 1) **What major changes will the automotive industry experience in the coming years and how does this affect the competitive landscape? Which strategic moves should traditional OEM's consider?**

The automotive industry is affected by several different forces and the intensity will certainly increase given the rapid rate of technological development, tightening of regulatory frameworks around sustainability policies, and changing customer preferences from car ownership to sharing. Considering these transformational forces, McKinsey outlined four pressing technological driven trends namely *diverse mobility*, *autonomous driving*, *electrification*, and *connectivity* which will disrupt the business model of traditional OEM's and suppliers.

Firstly, *mobility* will adapt to the increased introduction of mobility service providers such as UBER, MyCab etc. which allows users to conveniently book transportation services via the respective mobile application whenever they want. Moreover, the increased sustainable consumer mindset in conjunction with increased mobility services will most likely realize a shift from owning cars to sharing cars. By 2030, McKinsey estimates that consumers use shared mobility services for each specific purpose such as shopping, leisure, work commuting etc. Secondly, *autonomous driving* is high on the agenda although strict regulations will be a great challenge. Precisely, the development of safe and reliable technologies are of utmost importance which will increase consumer sentiment. Thirdly, *electrification* is regarded as the most pressing mega trend and is fueled by increased battery efficiency and stricter emission regulations. Electric vehicles (EV's) are becoming more competitive given the advances in battery technology in terms of higher efficiency and longer distances. The increasing amount of charging stations will likely increase adoption rates. In fact, McKinsey estimates a global share of EV's between 10%-50% in relation to new vehicle sales by 2030. Lastly, upgradable *data connectivity* service within vehicles is a pre-requisite for the rapid innovations of software

technology which allows drivers and passengers to connect to their vehicle with various technological devices such as tablets or smartphones (Gao, Kaas, Mohr, Wee, & Möller, 2016).

The competitive landscape of the oligopolistic market will become fiercer and more complex as an increasing amount of market players try to establish themselves in the industry. For example, mobility service providers, specialty OEM's like Tesla, and huge tech companies from Silicon Valley with lots of innovation capabilities are increasingly challenging traditional OEM's forcing them to collaborate with the new entrants. For example, BMW and Toyota collaborate in the field of battery and powertrain technology with the aim of creating synergies, combining strengths and expertise, and reducing development costs (MacCarthy, Blome, Olhager, Srai, & Zhao, 2016).

Software technology is regarded as a crucial differentiating factor for the automotive sector and one can expect to see more partnerships between digital providers and automakers. All in all, one can say that in this rapidly changing industry, OEM's must plan for uncertainty, drive transformational change and re-shape their value proposition because of the emerging consumer and technological trends. (Gao, Kaas, Mohr, Wee, & Möller, 2016).

**2) How did automotive supply chains evolve and what are its critical underpinnings today? Use company examples for your explanation.**

In the early 20<sup>th</sup> century, Henry Ford invented the “Ford System” characterized by JIT manufacturing and standardization and thus pioneered the lean manufacturing system by reducing waste in the production process and helping his workers to become more efficient. Ford was successful in producing the standardized Model T, but product differentiation was left out of the equation which on the other hand was later reflected in Toyotas Production System (TPS) (Lopresti, 2017). It becomes apparent that manufacturing was first driven by mass production of standardized vehicles governed by the “push” model meaning that production volumes are revealed solely by marketing and sales forecasts and not by customer orders. The production process typically followed an MTS approach which can be highly efficient and cost effective, if accurate demand forecasting is possible. (Madhani, 2017). Due to forecast driven production and no collective integration of data management systems between Tier 1, 2,3 and the OEM, problems such as overstocking, high inventory costs, high marketing expenses and low profitability were common (Ambe & Badenhorst-Weiss, 2010).

In the last 30 years, the automotive industry experienced structural changes and has evolved into one of the most complex, integrated SC's with different tier suppliers (1-3), OEM,

distribution centers, dealers and increasingly demanding customers. Moreover, the increasingly volatile business environment, shorter Product Life Cycles (PLC's), technological advancements and more customization demands resulted in an increasing focus to the pull model meaning that production starts with a customer order. Here, the agile manufacturing strategy is defined by MTO replenishment resulting in avoiding of excess inventory. A crucial underpinning is the sequential JIT delivery of components between Tier 1- and Tier 2 suppliers, and Tier 1 suppliers and OEM's. Crucial is the synchronization of the component deliveries from suppliers with the assembly process of the OEM ensuring an efficient and responsive manufacturing process. Generally, the optimal defining of SC strategies depends on the relationship between product type, SC and forecasting accuracy (Madhani, 2017).

Typically, automotive manufactures adopt a hybrid strategy between push and pull methods. The push system is used for "generic" products up to the decoupling point and characterized by physically efficient SC processes (lean). The pull system is adopted beyond the decoupling point and is characterized by responsive SC processes (agile). Speed and flexibility are key features to allow for rapid customization services (Ambe & Badenhorst-Weiss, 2010).

Another critical underpinning relates to the vast technological developments (vehicle technologies & ERP software use such as mySAP) and the speed of adoption among OEM's. The important point is to sustainably invest in new technologies even though it requires heavy investments in new technological infrastructure. The key is to pro-actively and collectively drive forward this transformational change among the different SC actors to leverage the long-term benefits and gain competitive advantage for the entire supply chain (Ambe & Badenhorst-Weiss, 2010).

**3) What defines BMW's corporate strategy in the last two decades and how does BMW create most value for their automobile segment? Please use Ansoff's Growth Matrix and Porter's Value Chain Framework.**

BMW's corporate strategy can be analyzed by using Ansoff's (1965) Growth Matrix in which he classified the strategies into four strategic directions based on two dimensions *product* and *market*. Each dimension brings about two types namely either *current* or *new*. BMW is a globally operating MNC which followed almost all strategic directions within the last 15 years.

In the past two decades, BMW successfully established and developed new markets for its existing product range by either setting up own production facilities or collaborating with strategic partners through Joint Ventures such as with the Chinese automotive manufacturer

Brilliance China Automotive Holdings Ltd. For example, BMW followed a corporate growth strategy through market development for the Asian region by entering the high-growth Chinese- and Malaysian market in 2003 with predominantly existing models (MIDA, 2018).

As the case reveals, BMW is a premium provider of automobiles and engages in constant innovation of its technologies and products. For example, to support the strategy NUMBER ONE >NEXT, BMW aggressively invests in electric- and hybrid drivetrain technology, as well as in autonomous driving technology aiming to develop and market new and innovative vehicles for the future. The BMW i models represents state of the art product development considering their futuristic design and usage of renewable and recycled materials. Moreover, i mobility services are integrated such as DriveNow, ChargeNow and ParkNow (BMW Group, 2018). In 2014, BMW developed a new BMW model positioned below the 3-series specifically to accommodate Chinese consumer demands which is an example of product development (Ewing, 2014). Moreover, the UK, in which BMW sells all three premium brands and which represents the fourth largest market, is a good example of product development strategy. UK sales of the BMW i, BMW iPerformance and MINI EV's for Q1 2018 amounted to 4,148 units (BMW Group, 2018).

Porter's (1985) Generic Value Chain provides companies with a framework for assessing and understanding the ways value is created and captured through primary activities and support activities. Firstly, a significant amount of value is created through inbound logistics and procurement defined by sourcing of high-quality production materials from a trusted network of suppliers. Given BMW's prime operations (manufacturing and assembly plants) in Germany and other European countries, materials are primarily sourced in this geographical area to minimize logistics costs and ensure timely supply. Secondly, BMW's global production operations are characterized by high flexibility to suit the growing diversity of drivetrain technology. Therefore, to be able to accommodate growing sales targets of an increasingly diverse fleet, BMW's efficient and flexible production architectures is constantly developing and therefore is a crucial value creating driver. Flexibility will be further fostered through scalable modular construction kits which allows the fitting of the different drivetrains to all models in the same production unit.

**4) What is BMW's SC strategy and are SC practices aligned to this strategy? Please use the Fisher Framework for your elaboration.**

To best explain BMW's SC strategy, it is helpful to first assess the two generic SC strategies lean and agile. Here, one can say BMW makes use of both referred to as leagile and is explained

by the adoption of lean (physically efficient) methods until the Decoupling Point (DC) and agile (responsive) methods beyond the DC. The SC actors up until the DC are BMW's different Tier suppliers and key features are quality, low cost, JIT and shortest lead time. For example, through modular standardization, BMW allows to forecast demand more accurate for production materials and components required until the DC since same modules can be used for different types of models. SC actors beyond the DC are distribution centers and end customers who trigger demand for the final vehicle. Given increasing customization desires, key features are speed, flexibility, information technology and partnering to deliver mass customized vehicles at the right time, quantity and place.

Essentially, up to the DC, make-to-forecast mode is dominant while beyond the DC, BTO is predominant. BMW's production follows the market strategy allows the company to flexibly and rapidly provide customized demand in different geographical regions: China, Americas, Europe. Central pillars of BMW's SC strategy revolves around quality, innovation, sustainability and cost-efficiency.

Its essential that implemented SC practices are aligned to the respective SC strategy. For example, BMW deploys smart software technology (Google Earth Location Services, Big Data management, Media monitoring etc.) which collects and assesses SC information from various sources. For example, the use of Google Earth allows BMW to locate and verify supplier locations and compare compliance, sustainability policies and risk by location. These practices in which smart technology is deployed fosters SC visibility and helps BMW in selecting or deselecting suppliers. If suppliers can't implement or don't respect the required sustainability policies according to BMW's sustainability standards, independent audits will take place. On the other hand, BMW awards outstanding supplier innovations with its BMW Supplier Innovation Award. This SC practice results in supplier innovation initiatives and overall leads to a culture of innovation among BMW's suppliers which is an integral part of BMW's SC strategy. Another example relates to BMW's pro-active approach in working jointly with suppliers by providing training programs in the field of sustainability compliance, production quality to name a few. Moreover, BMW works closely with suppliers in the field of module design and development with the aim of increasing and maintaining a flexible production system for BMW and its suppliers. This collective approach ensures a rapid and efficient supply of materials and components in the required quality thus adhering to a physically efficient and lean SC up to the decoupling point.



Considering BREXIT, BMW provides training to suppliers to make sure they are ready for custom clearance procedures. This enables the suppliers to acquire the competence to successfully deal with custom formalities. This SC practice is aligned to SC strategy in that it ensures an efficient and rapid admin process which results in lean supply processes. BMW is currently in the process of reorganizing its supplier logistics for products from the EU to the Republic of Ireland aiming to avoid import and export duties and custom clearance procedures. Products will be transported directly from the EU to the UK in an unregulated post-BREXIT scenario. In this way, the cost-efficient supply of products can be maintained to the Republic

To derive the most suited SC strategy, Fisher's (1997) framework focuses on the nature of demand of products. Fords Model T can be regarded as a functional product given the need of the pure physically efficient SC to produce the car. Therefore, there is a match between the functional product and the lean SC. Nowadays, BMW's product range consists of highly innovative vehicles of different models, designs, engines, drivetrains etc. Moreover, increased customization opportunities require market responsive SC's. Although the market responsive / agile SC solely matches the SC beyond the decoupling point and relates only to the final product (vehicle).

##### **5) What are BMW's UK major strategic SCM implications and associated cost factors given a hard BREXIT?**

Major strategic SCM implications of an unregulated BREXIT is an increase in component costs imported and exported from the EU to the UK and vice versa. This leads to a disruption of component flows used for the manufacturing of vehicles in the UK, especially for components which are imported from the EU. For example, a disruption of component flow for the MINI models will negatively affect lead times and the crucial JIT philosophy. The logical impact is to build up additional inventory – which bears increased inventory costs - to safeguard seamless production. The build-up of additional inventory for European components could lead to increasing warehouse capacity. Moreover, third country imports can be disrupted too given the fact that trade with third countries is governed by existing EU trade agreements. Given the implementation of trade barriers, the cost of vehicles will likely rise due to increases in taxes (important for consumers) and other economic factors. For example, the British Pound could further depreciate in the event of an unregulated BREXIT potentially causing a recession. This might further increase the costs for EU components. In this event, strategically important and less robust Tier suppliers might be forced out of business. The impact for OEM's might revolve

around an increase in local procurement and a shift of production to the EU at next investment decisions. On the consumer side, an increase in final car prices might increase.

The import of finished vehicles from the EU and vice versa require custom clearance procedures. Given an unregulated and likely chaotic BREXIT, the supply of these vehicles to the UK market can be hindered as ports of entry can become congested. This poses a negative impact on the lead time as the JIT sequenced production process is interrupted.

BMW mentioned that it closely works together with suppliers to ensure business continuity after BREXIT. Thus, it has established the BREXIT task force which has the mission to prepare suppliers. Moreover, BMW points out that strategic joint ventures could possibly be fostered so as to safeguard supply of strategic relevant components.

Broadly, hard-BREXIT costs<sup>1</sup> can be separated into different cost categories namely:

- BREXIT preparation costs<sup>2</sup>
  - BMW traineeship programs for suppliers
  - Legal and consulting expenses
- Non-tariff barrier costs
  - Custom handling procedures; respective admin fees for import and export clearance
  - Admin fees in relation to increased tax procedures<sup>3</sup>; filing of additional tax documents
  - Fees for migration processes of employees
- Tariff barrier costs – WTO duty
  - 10% on finished vehicles
  - 4.5% on components

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<sup>1</sup> At this point, it is unclear to quantify BREXIT preparation costs. Hawes estimates that the cost for the industry must amount to multi million British Pounds as of August 2017, including consulting firms advising on this issue (Conn, 2017).

<sup>2</sup> BMW declined to comment, but to provide a brief idea, Jaguar Landrover has spent 10 million British Pounds for BREXIT preparation as of July 2018 (Wiggins K. , 2018).

<sup>3</sup> UK shall not be bound to harmonized VAT law. Fundamental principle is the neutrality of transactions between entrepreneurs. VAT which is charged on a sale or service rendered to another entrepreneur must not increase the financial burden. The end user (consumer) must bear the burden.

**6) What strategic production decision(s) did BMW take in 2018 given an increasing level of trade pressures such as BREXIT? Evaluate decision(s) and explain potential reasons.**

BMW has expanded its production network close to its “Home Base” Germany by investing approx. €1 billion in a new production site in Debrecen, Hungary which has an annual capacity of 150,000 models. The main reason for this strategic production decision relates to increasing trade pressures caused by BREXIT. The major reason for this investment decision is to maintain a balanced growth between major markets (Asia, Americas) and the home market Europe considering that significant investments have been incurred in China, Mexico and USA in the previous years. This strategic move adds greater flexibility to the global production system by allowing production shifts between production locations. The plant in Hungary can produce combustion and electrified BMW models on the same production line. Other reasons are the very good infrastructure, good logistical connections and a proximity to existing suppliers. Moreover, the qualified personnel were also a decisive factor. In the event of a hard BREXIT, parts of UK manufacturing can be shifted to Hungary if MINI models can be produced. In this way, the BMW production network is more flexible to respond to market forces. The result is that risks are minimized, and costs optimized to provide a global balance of production.

Other strategic production decisions relate to a € 1 billion investment to upgrade German sites aiming to prepare them for the upcoming electrification phase. This strategic move allows BMW to shift production for the eMINI from the UK to Germany to avoid increased costs and admin processes in a hard post-BREXIT scenario. Lastly, BMW increased their labor force at the production site in Born, Netherlands. Production competence for the eMINI is provided and an increase in workforce points towards a possible production shift of the eMINI to the Netherlands.

**7) In what way do BMW’s “BREXIT” supply chain practices foster supply chain responsiveness? What can be improved?**

In a post-BREXIT situation, a responsive SC is characterized by speed and flexibility to adapt to a rapidly changing and uncertain business environment.

BREXIT SC practices from BMW are:

- Provision of training to suppliers via task force;
- Reorganization of supplier logistics and routing arrangements.

BMW provides training events to suppliers to make sure they are ready for custom clearance procedures as many only operated within the EU. The events were voluntary, and the effectiveness is difficult to judge, but naturally speaking these supplier informative events fosters the responsiveness of the supplier network. If suppliers are able to manage custom clearance procedures effectively and efficiently, the faster is the admin process and the less likely will components be caught up in supply stops due to regulatory compliance issues. The task force is structured into different work packages / streams meaning that each package has its individualities. Misfit between the work streams will not occur due to consolidation and progress sharing on a BMW AG perspective.

Reorganization of supplier logistics and rerouting arrangements take place with the goal of maintaining a cost efficient and responsive SC. For example, vehicles destined for the Republic of Ireland is currently routed via the UK for custom processes. In a post hard-BREXIT situation, the vehicle will directly be transported to the Republic thus avoiding import and export tariffs and custom clearance. The preparation of adapted routing arrangements fosters responsiveness insofar that on March 29, 2019, BMW and its suppliers are able to implement the arrangements rapidly. The prior collective planning with suppliers is crucial.

Based on the Supplier Perception Index 2015, it becomes apparent that BMW's suppliers perceived a decrease in the field *Help* which highly suggests that BMW should improve their relationship with suppliers by actively helping them, especially considering the complex and uncertain BREXIT situation. Moreover, an overall improvement in SC visibility would be deemed suitable. It is critical for BMW to assess suppliers who might be critically affected by an unregulated BREXIT. Their financial health and track record should be evaluated.

**8) Elaborate on BMW's strategic decision to produce the fully-electric Mini in Oxford, UK even in a post-BREXIT situation? In addition, elaborate on suitable strategic options.**

On the one hand, the production in the UK makes logical sense given that the UK is the largest market for the MINI globally and the UK is the "spiritual home". Moreover, a contributing factor certainly is the high investment in the production triangle (Oxford, Swindon, Hams Hall). The BMW Group has invested more than £2.4 billion from 2000 – 2015 in the triangle for the set-up of the production infrastructure, upgrade in robot technology, vehicle platforms, to name a few. More specific, the Oxford plant has been updated 4 years ago therefore much of the production technology including robots are only depreciated by 50%. Moreover, BMW has invested significant amount of time, effort and money to develop the production expertise

required to build MINI models. In a post-BREXIT scenario, BMW can increase domestic manufacturing of MINI components in the long-term. Lastly, the complexity of electric cars is reduced and less components are for example required for the engine and gearbox compared to a combustion fueled car. This suggests that fewer components for the eMINI need to be sourced from Germany.

On the other hand, BMW has several strategic options to produce the eMINI. Firstly, the company could shift production to the Netherlands given the already present production competence and infrastructure and increase in annual production capacity. Although model specific manufacturing infrastructure might be necessary and thus must be developed, but the overall production competence is provided. Given that components for MINI production in the UK are primarily sourced from continental Europe, an increase in eMINI production in the Netherlands would mean less trade barriers and custom handling procedures in a post-BREXIT situation. Moreover, most MINIs are sold outside of the UK and thus a 10% WTO duty would apply.

## 5 Discussion

The author expectation prior to the collection and analysis of the research findings was that an unregulated BREXIT poses great strategic SCM challenges for automotive manufacturers with significant cross border operations between the UK and EU. In a first step, the author tried to prove the research significance of BREXIT on BMW's automotive segment by assessing economic trade data. The significance is certainly confirmed when one considers the size of cross border trade of components for BMW's MINI model suggesting that roughly 90% of components are traded between the EU and UK until the MINI is finally built. To minimize the burden of WTO duties in relation to MINI production, BMW increased the production capacity at the contract manufacturer in Born, Netherlands. This flexibility is of great importance to BMW as it enables cost optimization opportunities. This volume flexibility is addressed by Madhani (2017) and confirms the importance of it. Apart from shifting production to other EU countries, another potentially feasible way to reduce WTO tariffs is to increase local (UK) procurement and foster its UK supply base. In this way, a reduced quantity of MINI components passes the English Channel.

In addition to component trade data, an important challenge relates to the transfer of expert knowledge between the production plants in the UK and EU. This additional administrative burden is certainly not severe, but BMW should inform and prepare its employees accordingly.

Madhani (2017) assesses vendor flexibility – key concept of supply network flexibility – which, one can say, is important than ever since it concerns the ability of reconfiguring a SC network. If suppliers lack required internal flexibility capabilities to successfully cope with the BREXIT situation, BMW must be able to sense appropriately and acquire this information to potentially select and deselect a given supplier. In other words, the ease of changing vendors is important. Kraljic's (1983) supply matrix serves as a good tool to assess and segment the vendor base based on the dimensions *supply risk* and *profit impact*. Therefore, BMW should seek to foster supplier relationships for products with high supply risk and high profit impact to ensure seamless supply for these strategic components. The goal is to collectively tackle the impacts of BREXIT to ensure a flexible, robust and competitive SC.

Apart from the additional monetary value of WTO duties on components and cars, custom clearance procedures will take effect and the research shows that a majority of BMW's suppliers are not even able to deal with custom processes given their sole operation within the EU. This requires BMW and its suppliers to fully prepare for this additional burden and as the results

show, it is of utmost importance that BMW pro-actively helps its suppliers in this regard. Mere informational supplier events may not yield the expected positive results to provide suppliers with the help they might need. Strategic supplier relationships should be fostered by BMW and a collaborative approach is crucial to maintain a lean, agile and highly competitive SC.

Given the level of complexity and integration of BMW's SC, as well as BREXIT uncertainty, there is a strong need for BMW and its suppliers to pursue ambidextrous strategies which concerns the build-up of dynamic capabilities. Theory from Teece (2007) and Lee & Rha (2016) states that adaptation, flexibility and agility are key competencies which are needed to successfully compete in highly uncertain global markets and to build resilient SC's. The key is to develop ambidextrous strategies on a long-term basis and thus the SC becomes more resilient and robust to SC disruptions. The ambidextrous capability building process entails SC sensing (visibility), SC seizing (agility) and SC reconfiguring (flexibility). Firstly, BMW makes use of sensing capabilities by deploying smart technology such as geo tagging of suppliers' locations to help in the supplier selection process. Moreover, Big Data is collected and analysed with a self-programmed algorithm which "transforms" unstructured data into structured data. Such tools are essential nowadays to effectively and efficiently structure, analyse and understand the amount of excessive information available online. Secondly, BMW is fostering its seizing capabilities by preparing measures (supplier training, routing arrangements, capacity increase at NedCar etc.) to be able to quickly react after BREXIT date. This agile approach allows BMW to quickly and efficiently adapt to the changing regulatory hurdles. Thirdly, combined sensing and seizing capabilities fosters final reconfiguration processes as the result is a more flexible supply chain.

BMW should assess strategically important items or items which may cause production stops if not delivered JIT. Therefore, an increase of buffer stock at warehouses for items of strategic importance seems plausible. Even though a build-up of inventory for strategic items may be costly, a complete factory shut down can cost millions. The fact that the automotive SC is extremely interwoven with many different Tier suppliers (1-3) and supply is based on sequence deliveries, a supply stop from a Tier 2 supplier extends through to the OEM potentially causing severe production shutdowns. For example, a major BMW supplier for steering gears, Bosch, failed to deliver this essential component given supply issues with its own suppliers and BMW was forced to stop production for several days. Therefore, the more flexible a supply network, the faster it can react to disruptions. To minimize dependency on major UK suppliers for strategically important components may be offset by engaging in backward integration policies.

BMW has recently decided to produce the eMINI in the UK. Nevertheless, considering the largest market for the MINI is the EU and most components are sourced from the EU, BMW should aim towards a partial shift of eMINI production from the UK plant to suitable other European production locations such as Born, Netherlands or the newly build plant in Debrecen, Hungary with the pre-requisite that required production competences are provided. Given the increase of production capacity in the Netherlands a partial production shift may be suitable to minimize BREXIT impacts.

Nevertheless, the UK is the spiritual home for the MINI and significant investments have been incurred in the last 20 years to build up the required production infrastructure (production triangle) and competence. Moreover, the production triangle has been upgraded recently and for example the “assembly robots” are not even fully depreciated highly suggesting BMW’s production commitment in the UK. Even though one can expect BMW’s long-term commitment to the UK, it is evident that SC configurations in light of BREXIT are taking place.

## **6 Conclusion**

An unregulated BREXIT has drastic strategic SCM implications for BMW and should not be played down considering the highly integrated and complex SC. The deep SC integration was certainly fostered through the harmonized regulatory framework of the EU with its fundamental four freedoms. Any changes to this harmonized trading union provide great challenges to every member of the respective SC’s.

Given the large size of cross border trade, the implementation of tariffs results in higher production costs. Non-tariff barriers such as custom clearance procedures and increased admin work result in a prolonged lead time given entry port congestions. To maintain an agile and flexible production and supplier network, it’s a pre-requisite for BMW to further pursue cooperation with suppliers and continue investing in innovative production technologies. The aim is to acknowledging BREXIT risks and implementing measures to minimize the impact.

In case BMW decides to keep its manufacturing base for the MINI (including eMINI) in the UK, it should consider strengthening its local manufacturing base to reduce trade barriers from components delivered from BMW Group plants overseas. Moreover, it should try to shift to UK suppliers as far as possible for standardized components in case they meet BMW requirements in terms of quality, cost, innovation and sustainability.



Regarding MINI and eMINI production, BMW should partially shift some of the production to the newly build plant in Hungary considering the required production competence is present. Another feasible option is to partially shift production to BMW's contract manufacturer in the Netherlands given the recent increase in production capacity. In this way, some of the direct trade costs (tariffs), as well as non-tariff barriers are bypassed.

The complex regulatory changes in light of BREXIT presents huge challenges for BMW suppliers. A good starting point for BMW is to organize supplier informative events to prepare them for the post BREXIT scenario. Although BMW should further help suppliers in this regard to be compliant and should offer training to suppliers as far as possible. BMW has the required expertise and resources for this regulatory change, but smaller "important" suppliers might lack it. This pro-active approach positively affects the entire SC and aids in ensuring business continuity. The success of BMW is largely dependent on the extent of how well the entire SC functions.

Even in case of a "deal", the fact remains that the UK shall be separated from the EU. The commonly achieved political, legal, fiscal and economic consensus shall cease to exist. The UK shall stand alone without the integration in a powerful and internationally well accepted alliance. Any deal can only minimize some uncertainties, but not conserve the confidence in a reliable member of the EU.

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## Strategic SCM Implications of an unregulated BREXIT – A Case Study

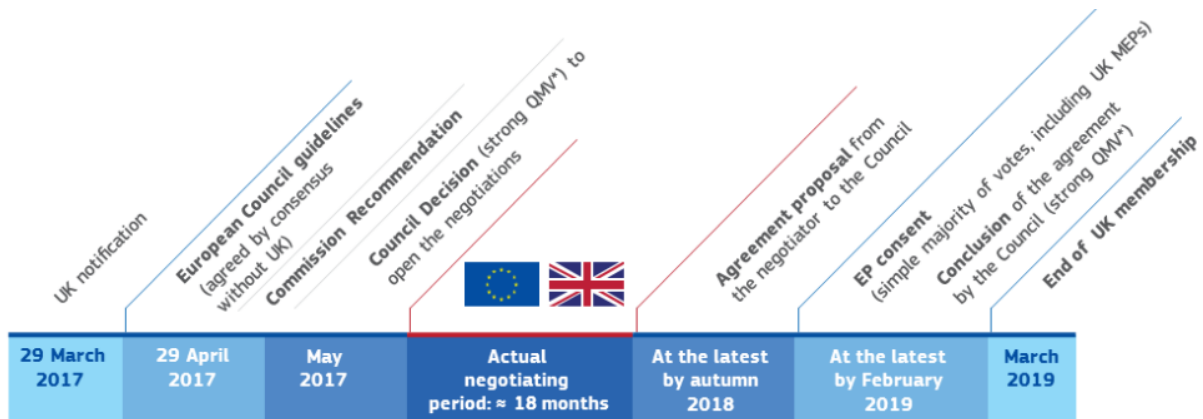
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## **Appendices**



**Appendix A: BREXIT Timeline**

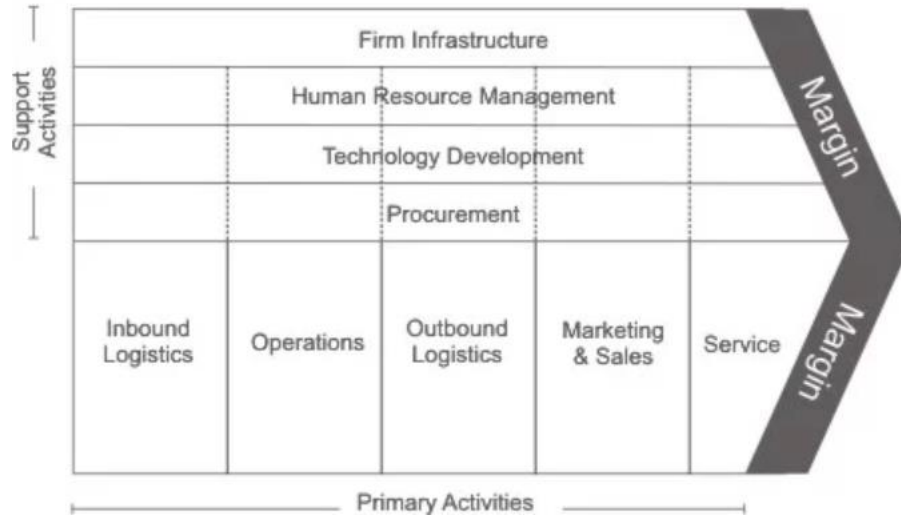


\* **Strong QMV** = 72% of the 27 Member States, i.e. 20 Member States representing 65 % of the EU 27 population.

Source: (European Commission, 2017)

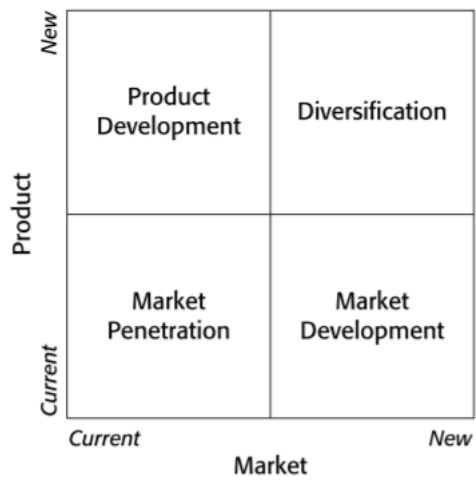
## Appendix B: Porter's Generic Value Chain

### Value Chain



Source: (Porter, 1985)

**Appendix C: Ansoff's Corporate Strategies**



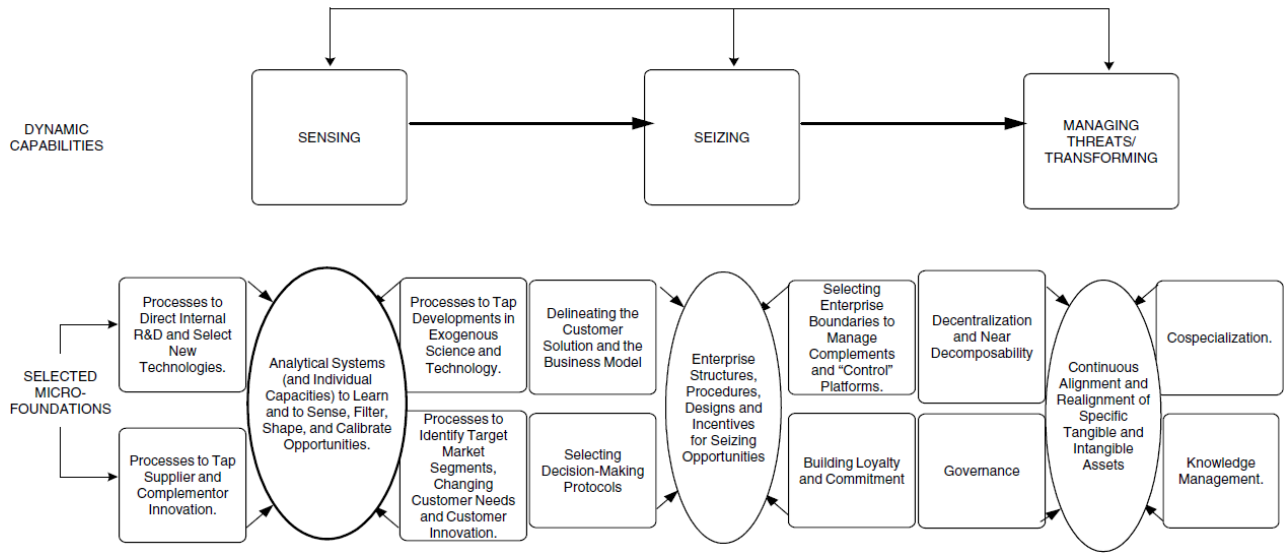
Source: (Ansoff, 1965)

**Appendix D: VRIO framework**

Resource valuable?	Resource rare?	Resource costly to imitate?	Resource supported by firm?	Competitive implication	Strength / Weakness	Economic performance
No	No	No	No	Competitive disadvantage	Weakness	Below par
Yes	No	No	No	Competitive parity	Strength	At par
Yes	Yes	No	No	Temporary competitive advantage	Strength with competitive advantage	Above par
Yes	Yes	Yes	Yes	Sustained competitive advantage	Strength with sustained competitive advantage	Above par

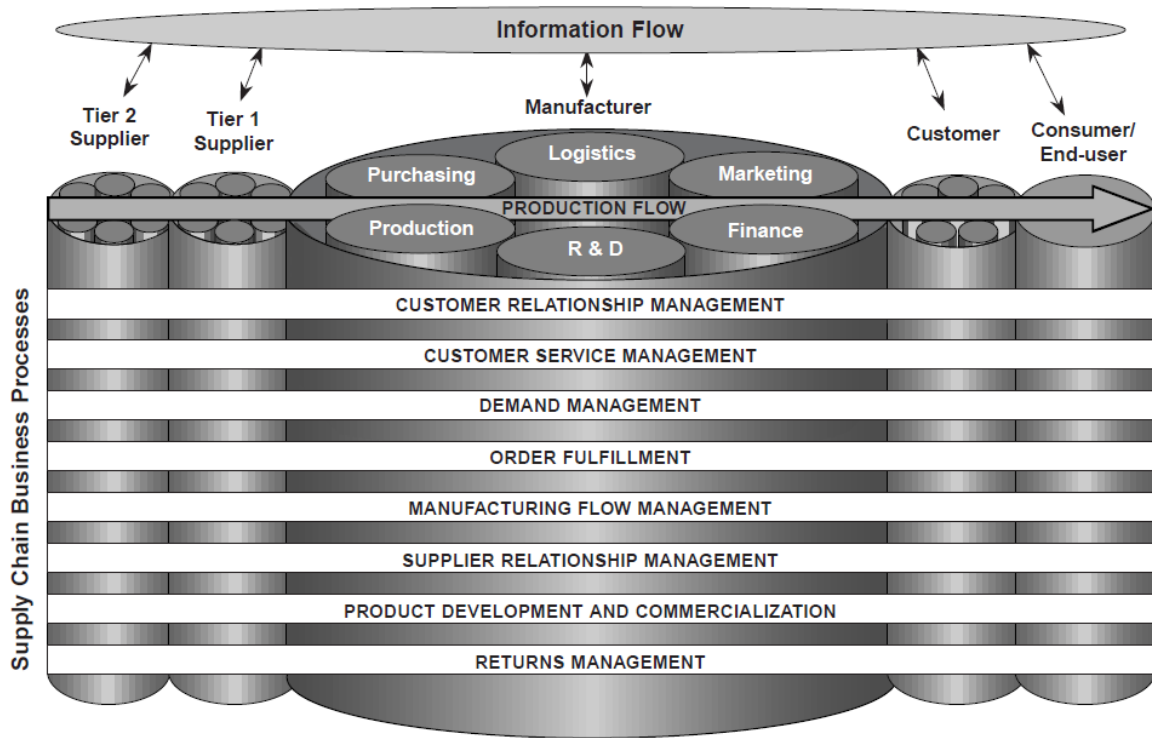
Source: Authors own

**Appendix E: Foundations of dynamic capabilities and business performance**



Source: (Teece, 2007)

**Appendix F: Supply Chain Management: integrating and managing business process across the supply chain**



Source: (Lambert, Cooper, & Pag, 1998)

**Appendix G: Demand characteristics of products and supply chain types by Fisher (1997)**

Table D-1: Functional vs Innovative Products

	<b>Functional</b> (Predictable Demand)	<b>Innovative</b> (Unpredictable Demand)
<hr/> Aspects of Demand <hr/>		
Product life cycle	more than 2 years	3 months to 1 year
Contribution margin*	5% to 20%	20% to 60%
Product variety	low (10 to 20 variants per category)	high (often millions of variants per category)
Average margin of error in the forecast at the time production is committed	10%	40% to 100%
Average stockout rate	1% to 2%	10% to 40%
Average forced end-of-season markdown as percentage of full price	0%	10% to 25%
Lead time required for made-to-order products	6 months to 1 year	1 day to 2 weeks

\* The contribution margin equals price minus variable cost divided by price and is expressed as a percentage.

Source: (Fisher, 1997)

Table D-2: Physically efficient vs market-responsive supply chains

	<b>Physically Efficient Process</b>	<b>Market-Responsive Process</b>
Primary purpose	supply predictable demand efficiently at the lowest possible cost	respond quickly to unpredictable demand in order to minimize stockouts, forced markdowns, and obsolete inventory
Manufacturing focus	maintain high average utilization rate	deploy excess buffer capacity
Inventory strategy	generate high turns and minimize inventory throughout the chain	deploy significant buffer stocks of parts or finished goods
Lead-time focus	shorten lead time as long as it doesn't increase cost	invest aggressively in ways to reduce lead time
Approach to choosing suppliers	select primarily for cost and quality	select primarily for speed, flexibility, and quality
Product-design strategy	maximize performance and minimize cost	use modular design in order to postpone product differentiation for as long as possible

Source: (Fisher, 1997)



**Appendix H: Kraljic's supply matrix**

<b>Profit impact</b>	<b>High</b>	<p><b>Leverage items</b></p> <ul style="list-style-type: none"> <li>• Standard, substitutable</li> <li>• Alternate suppliers</li> <li>• High volume or cost</li> </ul>	<p><b>Strategic items</b></p> <ul style="list-style-type: none"> <li>• Strategically important</li> <li>• Substitution difficult</li> <li>• No alternate suppliers</li> </ul>
	<b>Low</b>	<p><b>Noncritical items</b></p> <ul style="list-style-type: none"> <li>• Standard, substitutable</li> <li>• Alternate suppliers</li> <li>• Low volume or cost</li> </ul>	<p><b>Bottleneck items</b></p> <ul style="list-style-type: none"> <li>• Substitution difficult</li> <li>• Monopolistic market</li> <li>• Critical items</li> </ul>
		<b>Low</b>	<b>High</b>

**Supply risk**

Source: (Gangurde & Chavan, 2016)

## **Appendix I: External flexibility and supply network flexibility**

Note: The presented information is directly cited from (Madhani, 2017)

### **“There are five different types of external flexibility:**

- **New product:** the range of and ability to accommodate the production of new products
- **Mix:** the range of and ability to change the products currently being produced
- **Volume:** the range of and ability to accommodate changes in production output
- **Delivery:** the range of and ability to accommodate changes in delivery dates
- **Access:** the ability to provide extensive distribution coverage

### **There are two key concepts of supply network flexibility:**

- **Vendor flexibility:** refers to the flexibility related to individual vendors within the supply network, which may be manufacturing, warehousing or freight transportation, with each node having its own internal flexibility capabilities.
- **Sourcing flexibility:** refers to the ability of the system’s coordinator to reconfigure a supply chain network through selection and deselection of vendors, i.e., the ease of changing supply chain partners (Duclos et al., 2003), enabling the supply system to adapt to changes in the business environment (Vickery et al., 1999; and Swafford et al., 2008).”

**Appendix J: Determinants of lean, agile and leagile Strategies**

Table F-1: Key determinants of a lean and agile strategy

S. No.	Distinguishing Attributes	Lean Supply Chain Strategy	Agile Supply Chain Strategy
1.	Typical Products	Commodities	Fashion Goods
2.	Marketplace Demand	Predictable	Volatile
3.	Stockout Penalties	Long-Term Contractual	Immediate and Volatile
4.	Purchasing Policy	Buy Materials	Assign Capacity
5.	Product Variety	Low	High
6.	Product Life Cycle (PLC)	Long	Short
7.	Customer Drivers	Cost	Availability
8.	Profit Margin	Low	High
9.	Forecasting Mechanism	Algorithmic	Consultative
10.	Dominant Costs	Physical Costs	Marketability Costs
11.	Information Enrichment	Highly Desirable	Obligatory

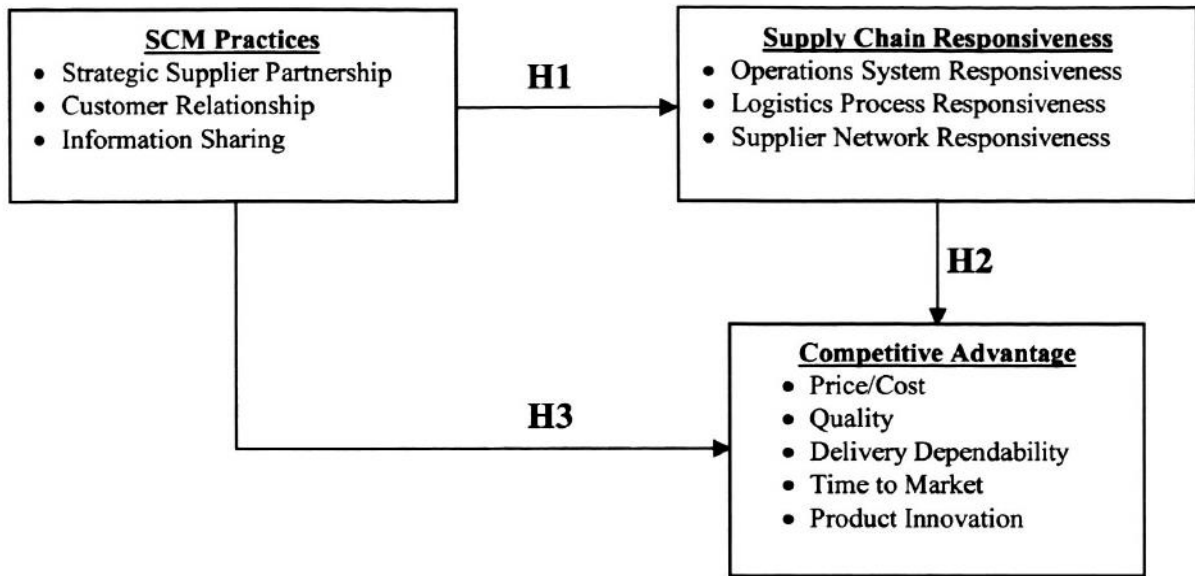
Source: (Madhani, 2017)

Table F-2: Key determinants of a leagile strategy

S. No.	Leagile Supply Chain Strategies	Suitable Market Conditions and Operating Environment
1.	Pareto/80:20: Lean methods for the volume lines, and agile methods for the slow movers	<ul style="list-style-type: none"> <li>• High levels of variety;</li> <li>• Demand is non-proportionate across the range</li> </ul>
2.	De-Coupling Point: Lean up to the de-coupling point and agile beyond it	<ul style="list-style-type: none"> <li>• Possibility of modular production or intermediate inventory;</li> <li>• Delayed final configuration or distribution</li> </ul>
3.	Surge/Base Demand Separation: Managing the forecastable element of demand using lean principles; using agile principles for the less predictable element	<ul style="list-style-type: none"> <li>• Where base level of demand can confidently be predicted from past experience and where local manufacturing, small batch capacity is available</li> </ul>

Source: (Madhani, 2017)

**Appendix K: Framework and definitions of types of supply chain responsiveness**



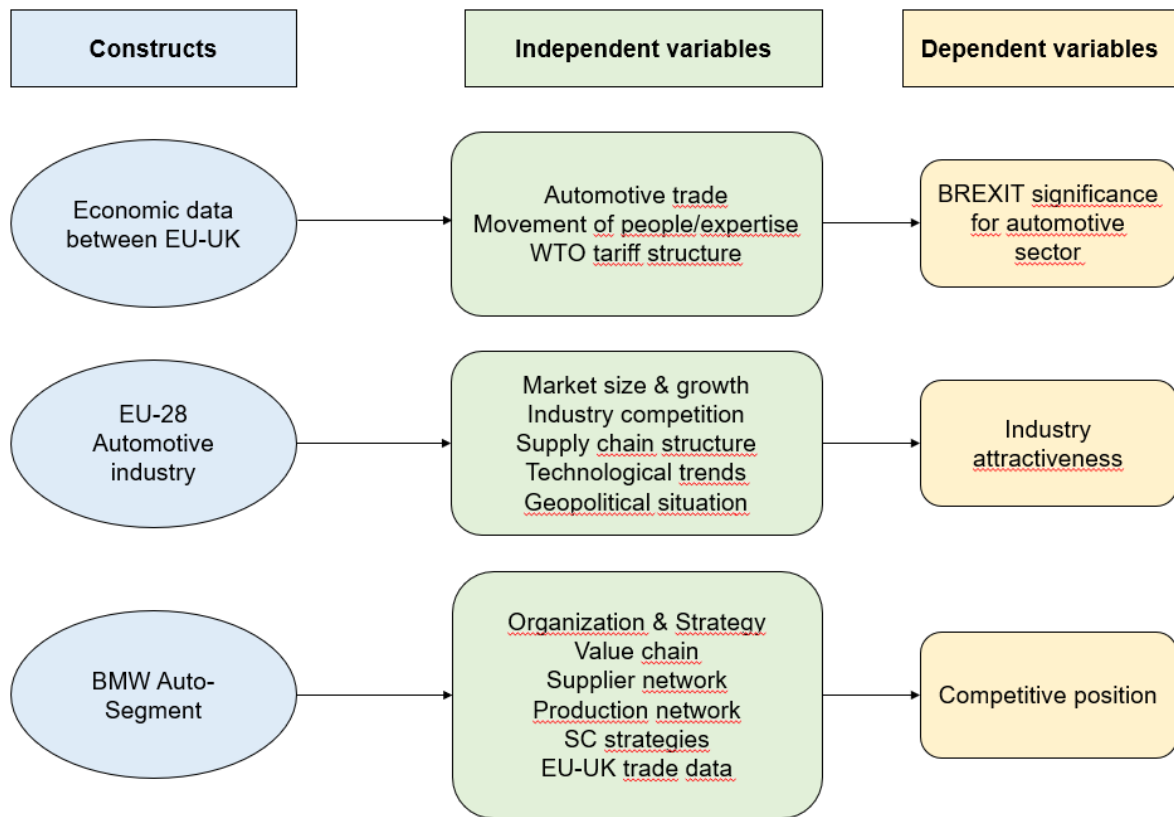
Source: (Thatte, Rao, & Ragu-Nathan, 2013)

Table G: List of sub-constructs for supply chain responsiveness

<b>Sub-constructs</b>	<b>Definitions</b>	<b>Literature</b>
Operations system responsiveness	The ability of a firm's manufacturing system to address changes in customer demand	Prater et al., 2001; Lummus et al., 2003; Duclos et al., 2003; Anderson and Lee, 2000; Radjou, 2000; Allnoch, 1997
Logistics process responsiveness	The ability of a firm's outbound transportation, distribution, and warehousing system (including 3PL/4PL) to address changes in customer demand	Prater et al., 2001; Lummus et al., 2003; Duclos et al., 2003; Bradley, 1997; Fuller et al., 1993; Richardson, 1998; Huppertz, 1999; Doherty, 1998; Swaminathan, 2001; Van Hoek, 2000
Supplier network responsiveness	The ability of a firm's major suppliers to address changes in the firm's demand	Prater et al., 2001; Lummus et al., 2003; Duclos et al., 2003; Jordan and Michel, 2000; Rich and Hines, 1997; Burt and Soukup, 1985; McGinnis and Vallorpa, 1999; Fisher et al., 2000; Bensaou, 1999; Mason et al., 2002; Cooper and Gardner, 1993; Choi and Hartley, 1996

Source: (Thatte, Rao, & Ragu-Nathan, 2013)

**Appendix L: Conceptual model**



Source: Authors own

## Appendix M: Interviews

### Interview with BMW

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**Interviewer:** Christopher Rosenthal; studying MSc Management at the ISCTE Business School in Lisbon, Portugal.  
E-Mail: [Chris.rosenthal473@gmail.com](mailto:Chris.rosenthal473@gmail.com)  
Phone: +49 (0)159 0411 3295

**Brief description:** The purpose of this written interview is to gain more in-depth knowledge of the challenging BREXIT situation at BMW. The interview answers shall complement the collected secondary data. A case study for bachelor and master students in the fields of Strategy and Supply Chain Management is developed.

**Problem:** Due to the integrated, complex and long supply chain structure of the automotive industry and the large size of cross-border trade of components and cars between UK's and EU's automotive supply chain actors, the implementation of a tariff scheme and custom handling procedures in the event of an **unregulated (hard) BREXIT** by March 2019 negatively affects the industry as sourcing of assembly parts and distribution of final cars becomes costlier. The crucial JIT philosophy is jeopardized due to inventory build-up of components to ensure seamless production/delivery to production plants.

**Interview:** Structured, written interview with open questions.

**Confidentiality:** The answers are treated in the most confidential manner as possible. The answers will solely be used for the case description and analysis as part of the thesis. This work may only be available to reviewers of the thesis and authorized members of the board of examiners.

### Questions:

**1. In the event of a „hard/unregulated BREXIT” what major strategic Supply Chain Management implications do you see for BMW's UK operation?**

*Supply chain and flow of components for manufacturing in the UK could be disrupted, especially where those components come from mainland EU. Third country import flows could also be disrupted because they are currently subject to existing trade agreements with the EU (UK being a member state) and these will need to be renegotiated or replicated post Brexit.*

*Import of finished vehicles from EU and third countries will be subject to duties, tariffs and customs clearance formalities whereas today they are not. The supply line of finished vehicles may be disrupted in the event of a chaotic and hard Brexit as ports of entry may become congested with general cargo bottlenecks. In both cases (components and finished vehicles) the implications relate to prolonged lead times.*

**2. How is the transfer of expert knowledge from the EU to the UK ensured if the free movement of people is hindered in a post “unregulated” BREXIT situation?**

*Presumably the EU expertise that is in free circulation today will be subject to an additional admin burden when considering migrating to the UK. To ensure continued transfer of such expertise, all parties will simply have to prepare for completion of these additional formalities, just as migrant workers from third countries do today.*

**3. What is the role of “strategic supplier partnerships (supply chain practice)” at BMW UK? What is being changed and/or implemented considering BREXIT?**

*Supplier logistics and routing arrangements are being reorganised to avoid unnecessary border crossings and payment of tariffs / duties. For example, today, product from mainland EU plants destined for Eire currently passes through the UK and undergoes some processing there before being transported to the Republic. Post Brexit, we aim to transport finished vehicles and motorcycles directly to Dublin from mainland EU thus avoiding import export duty and customs clearance.*

**4. M. Duesmann mentioned the implementation of a company-wide BREXIT task force to prepare suppliers. How will the task force prepare suppliers, how is it managed/set-up and what are the main responsibilities?**

*We are working with suppliers to ensure, first and foremost, business continuity on 29 March 2019. However this is ensured, may be suboptimal from a commercial or efficiency perspective. Once business continuity is ensured we shall optimise all supply lines over time to make sure greater economies and efficiencies are achieved.*

*The task force is set up with various work streams / packages covering several disciplines both from a BMW UK and BMW AG perspective ( e.g. WP1 – Sales fit for Brexit, WP2 – Aftersales & Parts, WP6 – Customs & Taxes ). Each work package is attending to its own supply chain individualities but with consolidation and progress sharing to avoid incongruence at any stage.*

**5. M. Duesmann points out that the supplier network in the UK is not as developed as on continental Europe. How large and flexible is BMW’s supplier network in the UK? What is the ease of changing vendors?**

*Not sure what the evidence is of a lesser developed supplier network in the UK than on the mainland. The supplier network in the UK is sufficiently developed, appropriately sophisticated and large enough to cope with today’s complexion of imports / exports to / from mainland EU and third countries. I do not see the supplier network becoming less effective post Brexit.*

## Strategic SCM Implications of an unregulated BREXIT – A Case Study

*All supply arrangements are mostly and currently formalised within fixed term contracts structured with strategic break points and review options. Changing vendors is not that easy therefore unless breach occurs mid contract or maturity is reached. Competitive tendering amongst profit maximising and enterprising networks will continue to be a feature post-Brexit.*

**6. How do you rate the ability (weak, moderate, strong) of BMW's major suppliers to address changes in BMW's demand for MINI components? In your view, what should suppliers improve?**

*Unable really to comment about ability rating here. I assume biggest improvement will need to be in pipeline visibility of stock and ability to supply much earlier in production lifecycle ( greater stock holding ).*

**7. Do you expect an increasing number of vertical integration policies (backward) from automotive manufacturers to safeguard the supply of strategic components?**

*Not necessarily, but depending on scenario being considered, it could be the case. Strategic joint ventures could feature and or exclusive supply contracts in return for premium pricing?*

**8. BREXIT will negatively impact the crucial Just-In-Time philosophy as inventory for materials and components will be required (safety stock) to safeguard seamless delivery to production sites. What are key supply chain practices/activities for BMW's UK MINI business and how do these practices ensure an efficient and responsive supply chain?**

*Unable to comment fully here.*

**9. Some components pass the English Channel as much as 4 times before the MINI is fully built. Can some of these components be entirely sourced in the UK in order to go around these trade barriers?**

*Quite possibly, but clearly this is an intuitive response that would require much greater analysis. It follows that the factors of production are abundantly present in the UK already and, who knows, the manufacturing base may well be forced to broaden in a post Brexit world. Depending on the nature of Brexit it seems rational to consider establishment of domestic manufacture and supply arrangements to reduce lead time and cross border trade barriers.*

**10. About 90% of components (MINI production) are sourced from continental Europe and roughly half of MINIS are exported to Europe. BREXIT will disrupt the import of these components to the UK (e.g. custom delays). In brief, how feasible do you see a re-location of the MINI production to continental Europe?**

*Some MINI models are already produced in continental Europe ( Born, NE ). Simplistically, it is therefore feasible to assume more MINI production could take place there subject to diversification of and investment in model specific manufacturing infrastructure. However, the Group has recently signalled a long term commitment to continued production at MINI Plant Oxford. UK remains the biggest single market for MINI in the World and is the spiritual home of the Brand but neither of these distinctions are safeguards in themselves.*



**11. BMW's management board has decided to manufacture the fully electric MINI in Oxford, UK, and not in the Netherlands or Germany. According to BMW, decisive factors are: heavy investments in the Oxford plant, plant was updated about 4 years ago, and equipment/automated robots are only half way through their lifecycle. Can you please elaborate a little bit on these factors? In addition, which other factors played a role in this decision?**

*Unable to comment fully here.*

**12. Does BMW see the future of its UK operations in jeopardy due to BREXIT? How much room is present to manoeuvre?**

*Cannot speak for BMW and strategic direction of such significance. All I can offer is that the UK remains BMW's 4<sup>th</sup> biggest national market on planet Earth behind China, US and Germany. The Group has an appropriately significant manufacturing presence in the UK, given the size of the market, just as it has in other 3<sup>rd</sup> country situations ( US, Mexico, China, South Africa ). It is possible that Brexit could jeopardise all this but there are huge commercial considerations to consider beyond whatever complications / supply buffers are presented post March 2019. There is plenty of material already in the public domain relating to this subject with views expressed by senior colleagues as recently as June 2018.*

**I would like to express my gratitude and appreciation to you for having spared some time to answer these questions.**

## Interview with Automotive Supply Chain Management Expert

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**Interviewer:** Christopher Rosenthal; studying MSc Management at the ISCTE Business School in Lisbon, Portugal.

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Phone: +49 (0)159 0411 3295

**Brief description:** The purpose of this written interview is to gain more in-depth knowledge of the challenging BREXIT situation within the automotive sector. The interview answers shall complement the collected secondary data. A case study on BMW for bachelor and master students in the fields of Strategy and Supply Chain Management is developed.

**Problem:** Due to the highly integrated, complex and long supply chain structure of the automotive industry and the large size of cross-border trade of components and cars between UK's and EU's automotive supply chain actors, the implementation of a tariff scheme and custom handling procedures in the event of an unregulated (hard) BREXIT by March 2019 negatively affects the industry as for example sourcing of assembly parts and distribution of final cars becomes costlier. The crucial JIT philosophy is jeopardized due to inventory build-up of components to ensure seamless production/delivery to production plants.

**Interview:** Structured, written interview with open questions.

**Confidentiality:** The answers are treated in the most confidential manner as possible. The answers will solely be used for the case description and analysis as part of the thesis. This work may only be available to reviewers of the thesis and authorized members of the board of examiners.

### Questions:

- 1. In the event of a(n) „hard/unregulated BREXIT”, what major strategic Supply Chain Management implications do you see for automotive manufacturers such as BMW which have significant UK operations?**

*The cost of components imported and exported from the EU to the UK and Vice versa will likely to increase. If no agreements are made between the UK and Europe it is likely that the flow of components will slow down with greater checks having to take place and with Brexit taking place in 2019, not enough time to put robust and effective processes in place. This will likely impact the rate at which vehicles in the UK are produced. The cost of vehicles is likely to rise in terms of taxes and other associated economic factors such as the UK potentially being in recession and strategically important tier 2 and tier 3 suppliers potentially going out of business. In essence there will be a lot more local procurement of parts in the UK, move operations into Europe at the next round of significant internal investment, increase prices to customers to cover off higher tariffs.*

- 2. The transfer of expert knowledge from the EU to the UK is crucial for automotive manufactures such as BMW. In your view, how can this transfer be ensured if the free movement of people is hindered?**

*This is also applicable for expert knowledge from the UK to Europe. There are many great minds in the UK in automotive. Just take Formula One as an example as the majority of Formula one teams are based in the UK and utilise the supply network in the UK. With the digital age people can work from almost anywhere. This allows the large OEMs to have Skype Calls and utilise shared working spaces to collaborate. This still doesn't beat face to face and there will always be a need to physically move people. In my opinion there will still be free movement of people. It may just be for a specific amount of time e.g. an internal project or like Switzerland the more days you go you have to pay to work there and pay the equivalent amount per day as a local person with a similar skill set would be paid.*

- 3. In your view, which key “strategic” measures should automotive manufacturers take to cope with this highly uncertain situation?**

*1. Monitor Supplier health (financial and delivery performance)  
2. Identification and monitoring of critical components (components which if not delivered to the line will stop production)  
3. Measure Movement of talent – are employees from Europe suddenly moving back home?  
4. Ask employees what they think they should through and online poll or similar to maintain confidence in the OEM from employees. Often the employees have great ideas but their voice is often not heard in the board room*

- 4. Many EU suppliers to the UK automotive sector don't have any practical experience in dealing with custom handling procedures. BMW mentioned the implementation of a company-wide BREXIT task force to prepare suppliers for a post “hard” BREXIT scenario. How do you evaluate this move from BMW? Do you think it will reap the expected positive results?**

*Possibly. No one knows what a “hard” Brexit or any Brexit will look like at the moment. The task force would be best placed to understand which items in their supply chain are most valuable (not necessarily from a monetary value) and to see which suppliers they come from and monitor their financial health and track record of delivery on time in full to the correct quality.*

- 5. Do you expect an increasing number of backward vertical integration policies from automotive manufacturers to safeguard the supply of strategic components?**

*Yes but it shouldn't stop with tier 1 suppliers. It must go back to tier 3,4 and or 5 as the further back you get the higher the dependency on smaller bespoke suppliers.*

- 6. BREXIT will negatively impact the crucial Just-In-Time philosophy as inventory for materials and components will be required (safety stock) to safeguard seamless delivery to production sites in the UK. In your view, what are key supply chain practices/activities for automotive manufactures in the UK to overcome/minimize this problem of inventory build-up? How do these practices ensure an efficient and responsive supply chain?**

*Just In Time will still exist. The OEMS need to make sure they understand their customers in their different markets much better and much deeper and the most popular options people select. This will allow OEMs to hold inventory of the items that move quickest and not tie up cash in inventory that moves very slowly. The main trouble is that with traditional OEMs, the dealerships hold relationships with the customers and not the OEMs directly. This is one of the reasons Tesla is different as they create “pop up” showrooms in shopping centres etc.*

- 7. What is the role of “strategic supplier partnerships (as a supply chain practice)” for the automotive sector? Would you agree that strategic supplier partnerships are more important than ever, especially in these turbulent and uncertain times? Please elaborate.**

*They are more important than ever, however the topic of supplier relationships, openness and supplier innovation is not new. With Brexit coming its more the relationships that will be stretched and tested like never before. This means a higher degree of openness and transparency to make sure any potential problems are caught early.*

- 8. BMW’s management board has decided to manufacture the fully electric MINI in Oxford, UK, and not in the Netherlands or Germany. Plants in both countries have the required production competence and capacity. According to BMW, decisive factors were: heavy investments in the Oxford plant, equipment/automated robots are only half way through their lifecycle. In your view, which other factors might have played a key role in this decision?**

*The fact that the mini is a British car and a long British history. No organisation is going to write off millions of Euros or Pounds of investment into plant and equipment in case something might or might not happen. That is too short term focused and any move would take longer than the amount of time until Brexit takes place and cost too much to justify.*

- 9. Do you see the future of automotive manufacturers with significant UK-EU operations in jeopardy due to BREXIT?**

*Not as many OEMs have a presence in the UK and Europe*

- 10. The automotive sector is a vital part of the UK economy. Do you expect the provision of UK governmental incentives to automotive manufacturers given the realization of a hard BREXIT?**

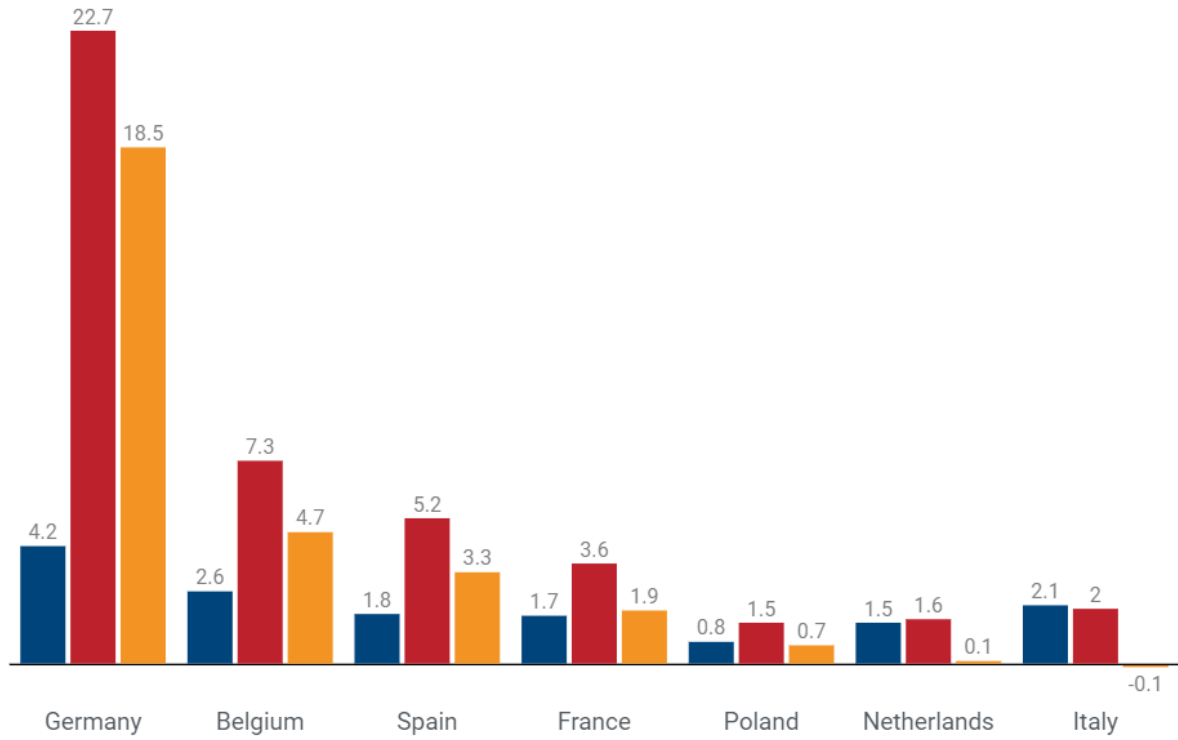
*There is no way the government can let the UK automotive industry to fail as the impact will be too high to the country as a whole. The provision of automotive incentives may have to be given to keep/increase the amount of automotive work carried out in the UK. On the other hand given a hard Brexit, the value of the pound is likely to drop potentially making the UK a cheaper option for investing in.*

**I would like to express my gratitude and appreciation to you for having spared some time to answer these questions.**

**Appendix N: Imports and exports of motor vehicle and automotive components between the UK and EU**

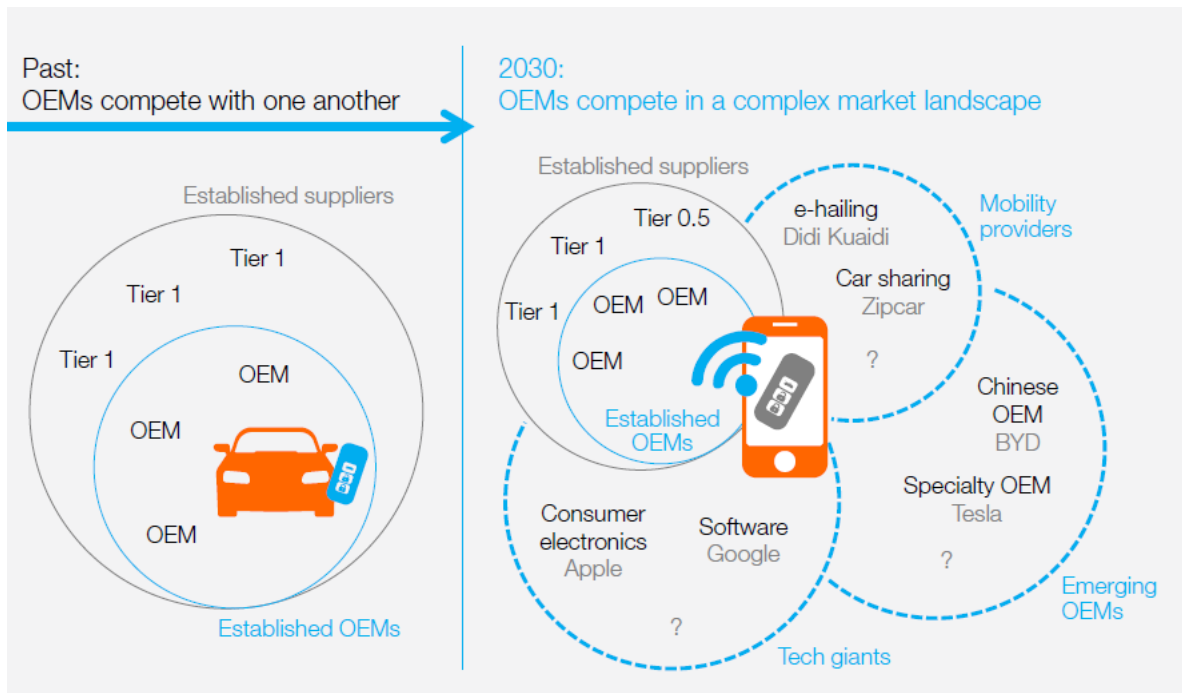
in billion euros | 2017

■ Imports from UK ■ Exports to UK ■ Balance



Source: (ACEA, 2018)

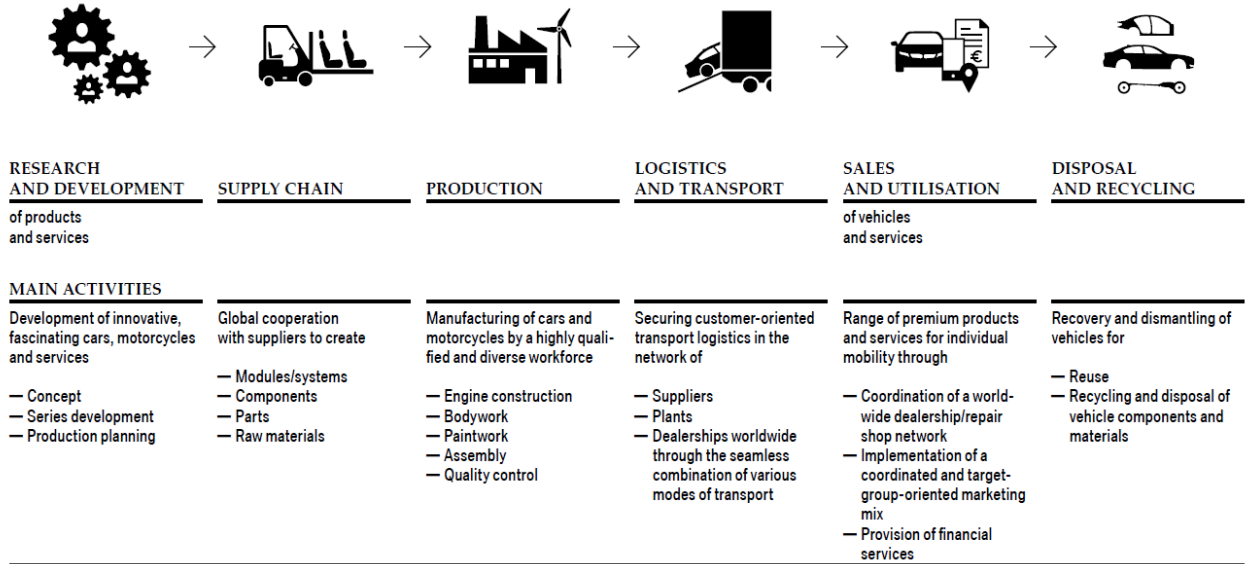
**Appendix O: New competitive landscape**



Source: (Gao, Kaas, Mohr, Wee, & Möller, 2016)

**Appendix P: BMW's value chain**

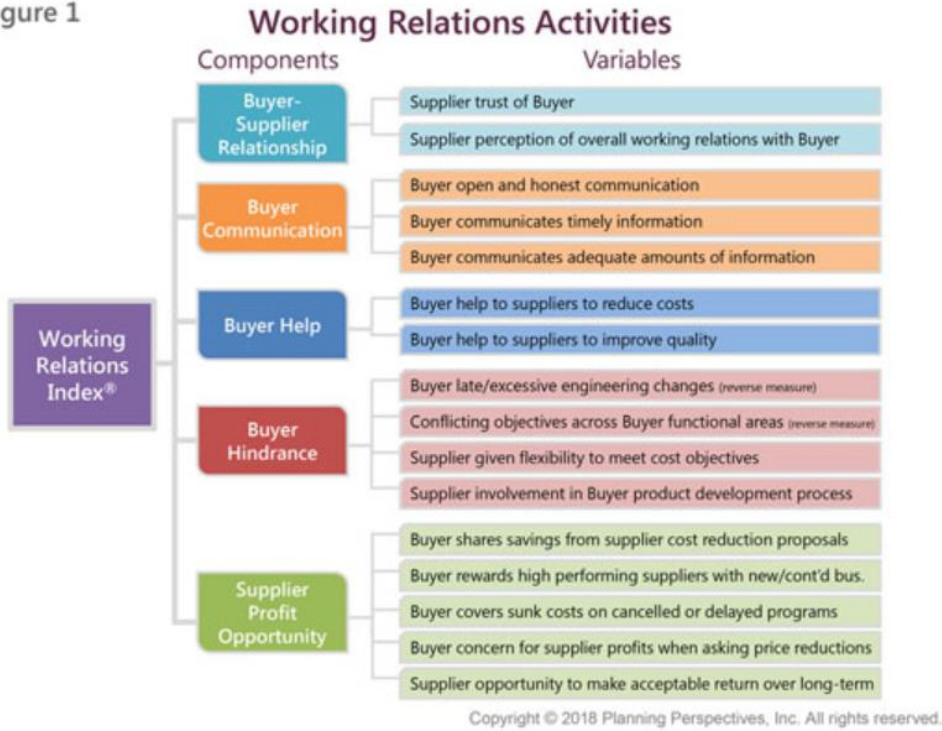
**VALUE CHAIN**



Source: (BMW Group, 2017)

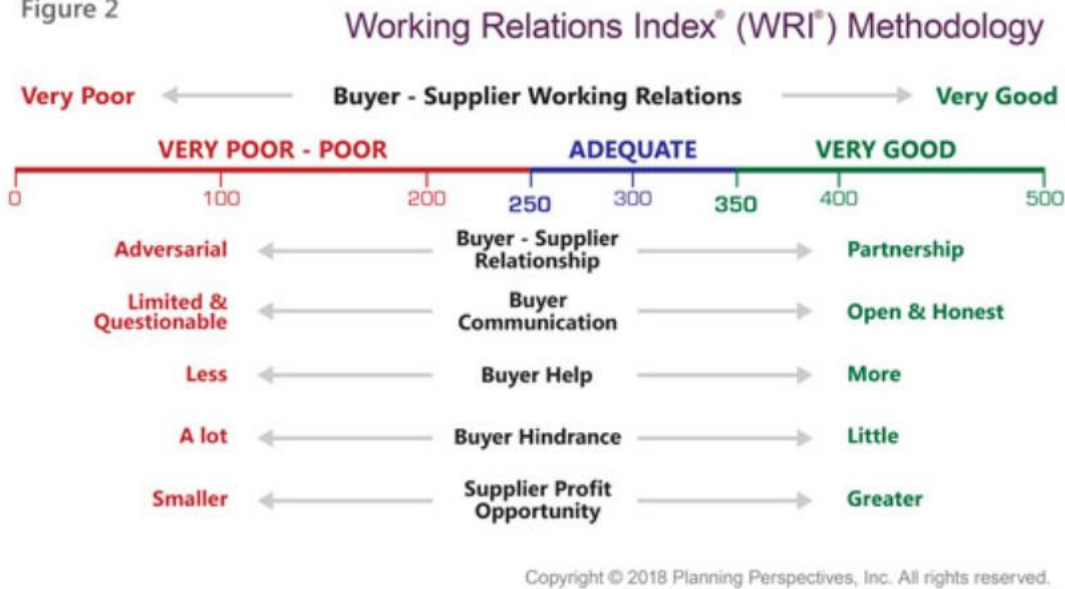
**Appendix Q: Information on Supplier OEM Relation Index**

Figure 1



Source: (Planning Perspectives Inc., 2018)

Figure 2



Source: (Planning Perspectives Inc., 2018)



**Appendix R: Resolution Documents**

Resolution Documents

Question	Document type	Author(s) and Year	Notes to content
<b>1</b>	a. Expert report b. Video <a href="https://mck.co/2yaIGze">https://mck.co/2yaIGze</a>	a. (Gao, Kaas, Mohr, Wee, & Möller, 2016) b. McKinsey	a. Trends and perspectives towards 2030 b. Same as a!
<b>2</b>	a. Scientific article b. Scientific article c. Scientific article	a. (Ambe & Badenhorst-Weiss, 2010) b. (MacCarthy, Blome, Olhager, Srail, & Zhao, 2016) c. (Madhani, 2017)	a. Evolution of automotive SC's, SC strategies, lean & agile, leagile b. Evolution of automotive SC's c. SC strategies, lean & agile, leagile
<b>3</b>			a. Ansoff Growth Matrix b. Porter Value Chain
<b>4</b>	a. BMW interview b. Scientific article c. Scientific article d. Scientific article	a. (Price, 2018) b. (Qrunfleh & Tarafdar, 2013) c. (Madhani, 2017) d. (Fisher, 1997)	a. Reorganization of supplier logistics and routing arrangements b. Lean & agile strategies, responsiveness c. SC strategies, lean & agile, leagile d. Matching products with SC type
<b>5</b>	a. BMW interview b. Expert report / Industry specific report	a. (Price, 2018) b. (PA Knowledge Limited, 2017)	a. Strategic SCM implications of hard BREXIT b. BREXIT impact on automotive SC
<b>6</b>	a. BMW press release	a. (BMW Group, 2018)	a. Investment in new production site Hungary
<b>7</b>	a. Scientific article b. Scientific article	a. (Qrunfleh & Tarafdar, 2013) b. (Thatte, Rao, & Ragu-Nathan, 2013)	a. Lean & agile strategies, responsiveness b. Impact of SC practices on SC responsiveness
<b>8</b>	a. BMW interview b. SCM expert interview	a. (Price, 2018) b. (Clark, 2018)	a. Production decision b. Production decision