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The Business Portfolio Synergy Analyzer: A Model for Evaluating Synergies between Business Models and its Application to BMW

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Title:

The Business Portfolio Synergy Analyzer: A Model for Evaluating Synergies between Business Models and its Application to BMW

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Abstract:

For several years, the automotive industry is experiencing substantial changes. New business models around CASE (connected, autonomous, shared, electric) driving have established in the market due to changes in the environment and regulatory and customer preferences, giving rise to new competitors coming from a wide range of industries. Incumbents are forced to review and adapt their portfolio. Positive synergies between the new and existing business models are even more important to create a unique ecosystem, which in turn can create a competitive advantage. Therefore, portfolio managers need a tool to effectively analyze synergy potentials, which can facilitate implementation decisions of new business models. This work analyzes existing frameworks from the literature and the automotive industry ecosystem. Based on this, a new tool was created that qualitatively and quantitatively captures synergies between a new business model and the existing portfolio. It provides management with recommendations for integration or separation. In order to test and evaluate the framework for feasibility and practicability, it was applied to BMW's business model portfolio using an example. The results of this work are based on the scientific literature and the interviews conducted with experts from the automotive industry.

Keywords: business model portfolio, synergy effects

Título:

O Analisador de Sinergia de Portfólio de Negócios: Um Modelo para Avaliar Sinergias entre Modelos de Negócios e sua Aplicação à BMW

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Resumo:

Por vários anos, a indústria automotiva esteve passando por mudanças substanciais. Novos modelos de negócios em torno da direção CASE (conectado, autônomo, compartilhado, elétrico) se estabeleceram no mercado devido às mudanças no ambiente e às preferências regulatórias e dos clientes, dando origem a novos concorrentes provenientes de uma ampla gama de setores. Os titulares são forçados a revisar e adaptar suas carteiras. Sinergias positivas entre os modelos de negócios novos e existentes são ainda mais importantes para criar um ecossistema único, que por sua vez pode criar uma vantagem competitiva. Portanto, os gerentes de portfólio precisam de uma ferramenta para analisar efetivamente os potenciais de sinergia, o que pode facilitar as decisões de implementação de novos modelos de negócios. Este trabalho analisa quadros conceptual existentes na literatura e no ecossistema da indústria automotiva. Com base nisso, foi criada uma nova ferramenta que captura qualitativa e quantitativamente as sinergias entre um novo modelo de negócio e o portfólio existente. Ele fornece gerenciamento com recomendações para integração ou separação. Para testar e avaliar a estrutura quanto à viabilidade e praticidade, ela foi aplicada ao portfólio de modelos de negócios da BMW usando um exemplo. Os resultados deste trabalho são baseados na literatura científica e nas entrevistas realizadas com especialistas da indústria automotiva.

Palavras-chave: portfólio de modelos de negócio, efeitos de sinergia

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List of Abbreviations

ACEA	Association des Constructeurs Européens D'Automobiles
BEV	Battery electric vehicle
BM	Business Model
BMI	Business Model Innovation
BMP	Business Model Portfolio
BMW	Bayerische Motoren Werke
BPSA	Business Portfolio Synergy Analyzer
CASE	Connected, Autonomous, Shared, Electric
DCF	Discounted Cash Flow
DNA	deoxyribonucleic acid
e.g.	exempli gratia (English: for example)
et al.	et alii (English: and others)
EU	European Union
ICE	Internal combustion engine
i.e.	id est (English: that is to say)
IoT	Internet of Things
KPI	Key performance indicator
M&A	Merger & Acquisition
NPV	Net Present Value
OEM	Original equipment manufacturers
p.	page
PwC	PricewaterhouseCoopers
R&D	Research & development
SAE	Society of Automotive Engineers
UK	United Kingdom
USA	United States of America
USB	Universal Serial Bus
vs.	versus
VW	Volkswagen
Wi-Fi	Wireless Fidelity

1 Introduction

The automotive industry has witnessed substantial changes in the last decades. CASE (connected, autonomous, shared, electric) driving is now paving the way for the next step in the industry's development (Kuhnert et al., 2018; Weber et al., 2019). The big car manufacturers in the traditional automotive industry, still somewhat battered by the diesel scandal, now face threats from many different directions (Hanelt et al., 2015). New market entries by battery electric vehicle (BEV) manufacturers such as Tesla, software companies such as Google, consumer electronics manufacturers such as Apple and peer-to-peer service providers such as Uber are pushing into the market with all their power, thus triggering a paradigm shift in the automotive industry by changing the production of cars to more environmental-friendly cars, by turning the car into a computer on wheels, by changing the way people move or by making the intervention of the driver redundant (Hanelt et al., 2015; Peters et al., 2016; Riasanow et al., 2017; Tian et al., 2016; Yin et al., 2017). These new business models (BM) and new entrants have the potential to be disruptive to incumbents. Many original equipment manufacturers (OEM) already became active in these areas and added digital BMs to their existing activities. It follows, that traditional BMs need to be reconsidered and portfolio management decisions, regarding the expansion and/or divestment of business models, need to be addressed. This results in the following dilemma for automobile manufacturers: How to implement a new business model into the portfolio? This thesis will focus on the question how car manufacturers can uncover synergy effects between their existing operations and new business models. Evaluating the strength of synergy effects is important in order to decide whether to integrate or separate a new business model.

In the first part of this thesis, the business model theory and synergy effects are first defined and outlined. The next part of the thesis is dedicated to the methodological approach. More precisely, an overview of the current automotive industry is given and, with the help of the literature research from the first main part, a model is created that will be dedicated to contribute to a better understanding of synergy effects between existing and new business models. The functionality and feasibility of the model will then be demonstrated through the application to one company, BMW, and tested through interviews with managers from this company. The final part of the thesis is the discussion and conclusion. In this section the transferability to other industry sectors will be examined.

2 Theoretical background

2.1 Business models and managing business model portfolios

Business models. Coupled with the uprising of the Internet in the mid-1990s, the business model concept has gained increasing importance in academic literature (Zott et al., 2011). According to Remane et al. (2017, p. 4) in particular, a business model is a means of explaining "what value is provided (by a company), how this value is created and delivered, and how profits can be generated". By this logic the linkages between all independent business activities should reflect the customer's needs and therefore create an unique sustainable and competitive advantage (Teece, 2010; Zott et al., 2011). Aversa & Haefliger (2016) specify activities as a collection of processes, resources and capabilities that companies use to implement their business models and pursue their goals. From Porter's (1987) point of view, firms compete within business units which he describes as a set of activities. Further research shows a business model consists of four pillars containing nine building blocks (Osterwalder & Pigneur, 2010). Pillar 1 represents the pool of products/services that create value for the customer (value proposition). The second pillar focuses on the customer segment and how it is addressed and linked to the company (value delivery). Key infrastructural components (resources, partners, activities) are bundled in pillar three – value creation. Last but not least, in pillar four it is all about finance – how to create revenues, what are the costs of the business model (value capture) (Günzel & Holm, 2013; Hanelt et al., 2015; Osterwalder & Pigneur, 2010; Remane, Hanelt, Tesch, et al., 2017). In order to survive in the market, a correct implementation of the BM and continuous detailed strategic assessments are necessary (Teece, 2010).

Business model innovation. As mentioned above, a company's BM is threatened from time to time due to external effects, e.g. technological developments/improvements or new market entrants, that try to disrupt the market with a new BM by adopting and/or shifting the customer's need. In order not to be outcompeted by other players in the market, business model innovation (BMI) is an important part of the competitiveness of companies (Zott et al., 2011). Therefore, BMI has become equally important in management research over the last two decades (Foss & Saebi, 2017). BMI requires the definition of [1] the value proposition (i.e. the value that is created by a product or service); [2] the underlying market segment(s) and mechanisms to generate revenues (i.e. who are the customers and what is the purpose); [3] the assets required to offer and deliver the product or service in the value chain; [4] the revenue mechanism(s); [5] the cost structure; [6] the value network (i.e. how is the firm connected to customer and suppliers and what are potential partners and competitors); and [7] it should articulate the

competitive advantage(s) over rivals (Chesbrough, 2010). From this follows that BMI is defined as "the conceptualization and implementation of new business models" (Geissdoerfer, Vladimirova, & Evans, 2018, p. 405). This may involve the development and/or the acquisition of new BMs, or the diversification or transformation of existing BMs. In the case of a transformation it can have an impact on a single or more components of the BMs pillars or on the entire BM (Geissdoerfer et al., 2018).

To achieve BMI there are some barriers to overcome. Christensen (1997) described the 'innovator's dilemma' as a phenomenon where incumbents tend to stick with their existing technology instead of investing in emerging disruptive technology due to typically significantly lower gross margins compared to existing technology. Another issue that Christensen found in this work was that resources were not allocated to their best fit, mainly due to highly uncertain market and technological potentials of the new BM. Chesbrough (2010) concludes that cognitive inertia often obstructs BMI. To overcome these barriers it is important to change the organizational landscape and the mindset and culture of the company towards a more resourceful attitude to embrace the new BM (Chesbrough, 2010; Suh et al., 2020). The most common methods of BMI studies in industry are cost reductions, process optimizations, introduction of new products & services, new market entries, different aspects of improving organizational performance, and enhancing financial performance (Foss & Saebi, 2017). However, there arise difficulties in measuring the financial performance enhancement of the BMI, partly due to a lack in academic literature to determine these effects (Foss & Saebi, 2017). Nevertheless, Zott & Amit (2008) found an improvement in performance in companies that can demonstrate a suitable interaction of the BM design and the product market strategy. Cucculelli & Bettinelli (2015) observed improved performance effects over time in firms with transformed BMs. According to Bohnsack, Pinkse & Kolk (2014, p. 297), there are many different influences that can cause BMI, i.e. changes in "regulation, customer preferences, competitive moves of rivals, technological developments, and the emergence of best practices" or even financial crisis, like 2008 or the more recent COVID-19 crisis in 2020. These constant challenges from different directions naturally keep driving new players onto the market, challenging the incumbent's status on the market with new innovative business models or even a variety of BM. Established companies are thus constantly under pressure to keep pace and modify their BMs constantly, faster and more profoundly than in the past (Fleming et al., 2019; Remane, Hanelt, Nickerson, et al., 2017; Telang et al., 2019; Weber et al., 2019).

Business Model Portfolios. In order to transform the strategy, companies do not only make changes to their existing BM, but they also create a range of different BMs by either inventing or acquiring new business models to their business model portfolio (BMP). For the purpose of satisfying different markets or market/customer segments, and consequently creating and capturing value, firms operate multiple BMs at the same time (Aversa & Haefliger, 2015; Markides & Charitou, 2004; Pagani, 2013; Snihur & Tarzijan, 2018; Zott et al., 2011). Porter (1996, p. 77), who was not actually allied with the idea of dual strategies, even suggested that: "companies seeking growth through broadening within their industry can best contain the risks to strategy by creating stand-alone units, each with its own brand name and tailored activities". Firms can therefore create competitive advantages over their rivals by for example creating "lock-in" effects[1] (e.g. Apple's devices share the same operating systems) (Hacklin et al., 2018; Osterwalder & Pigneur, 2010; Remane, Hanelt, Tesch, et al., 2017).

BMP enlargements are often also a matter of diversification. Companies diversify their BMP because of growth potentials (i.e. attractive industry) and efficiency effects (risk spreading and economies of scope[2], e.g. Apple's production of iPods, iPhones and iPads; internal capital markets, e.g. sharing of already available human capital within the company) (Besanko et al., 2013). Diversification can happen in three different directions (horizontal, vertical and lateral). *Horizontal* diversification means that the company expands its range with new products/services similar to its existing products and at the same economic level. The new products are related to the old products. An example would be when BMW expands its product range by adding MINI to the Group. In terms of *vertical* diversification, the company is expanding its value chain. This can be done either forward in the direction of sales (e.g. by opening its own stores) or backwards in the direction of production (e.g. a car manufacturer acquires a supplier of raw materials) (Besanko et al., 2013; Brickley et al., 2016). The third option is *lateral* diversification. Here, the company extends its range of services to include products that have no connection with its existing product range. For example, large companies often buy smaller companies whose services do not compete with their own product range in order to expand their service repertoire (Hako, 1972). An example of such a conglomerate would be BMW producing clothes (e.g., in a joint venture with PUMA). Companies also have to consider their geographical scope, as regulatory and market circumstances might differ from

[1] "Lock-in" effect = The lock-in effect describes a relationship of dependence between a customer and a provider. Switching to another provider is uneconomical due to high switching costs.
[2] Economies of scope = The costs of production of one good reduces the ones of another related good. Therefore, the production of a variety of goods and services leads to cost efficiencies.

continental, national or even local borders (Besanko et al., 2013), which Aversa & Haefliger (2016) introduced as another dimension of diversification.

Operating diverse BMs allows firms to utilize different approaches to create value for their customers and generate profits. A very interesting example from the automotive industry is BMW, which has established a venture capital fund (BMW iVentures) that focuses its investment strategy on supporting projects on new mobility and CASE driving, such as Life360[3], Lime[4] or Tekion[5]. This venture capital fund gives BMW the opportunity to operate and generate revenues in an industrial sector other than the automotive industry. At the same time, they gain insights into the direction in which the automotive industry is currently moving and are given the opportunity to get involved at an early stage and stay one step ahead of their competitors. Firms hence can overcome constraints of their current strategic approach and by diversifying their portfolio to further develop their corporate strategy. The corporate strategy is used to make the right decisions for selecting specific BMs and managing the company's BMP (Snihur & Tarzijan, 2018).

Managing BMPs. In order to manage a portfolio as efficiently and sustainably as possible, it is essential to always have an overview of all activities and BMs in order to monitor the portfolio accordingly. Consequently, the portfolio manager should be able to understand the interdependencies of the individual BMs and, to a certain extent, be able to predict future developments of the portfolio. In the following only the two most prominent approaches of managing BMPs will be examined (Porter's "Essential Tests" and Markides & Charitous strategies to run dual BMs). To achieve "successful diversification a company must first take an objective look at its existing businesses and the value added by the corporation" (Porter, 1987, p. 20). Porter's (1989) three "Essential Tests" are a tool for managers to determine whether diversification will add value to the corporate strategy. The attractiveness test is about the chosen industry's capability to be profitable. The cost-of-entry test should reflect whether the costs would not swallow all profits. Last but not least, the better-off test shows if the new BM would help to create a competitive advantage (Porter, 1987). Portfolio managers should also take a look at the extent to which the individual BMs are in competition with each other (Markides & Charitou, 2004). For this reason, a BMP must be properly managed and monitored, as multiple BMs can both drive growth, but also have the potential to increase conflicts between

[3] Life360 is providing family safety services like location sharing, place alerts, navigation and driver reports.
[4] Lime is a mobility company offering a sharing for e-scooter, e-bikes and pedal bikes.
[5] Tekion is providing digital business applications with their cloud-based leading product "Automotive Retail Cloud", connecting consumers, dealers and OEMs seamlessly.

existing BMs, ultimately creating risk of cannibalization (Aversa & Haefliger, 2015; Globocnik et al., 2020; Hofmann, 2005). For this reason Markides & Charitou (2004) propose four different strategies depending on their similarity and their nature of conflicts between the different BMs, when managing a BMP (Appendix Figure A1). They propose a separation strategy – a decentralized/autonomous approach – when there are major conflicts and a low strategic relatedness between the businesses. This strategy obviously hinders the exploitation of any synergy effects within the company and thus increases complexity through, for example, reduced knowledge transfer between BMs and additional organizational constraints. In contrast a company should follow the integration strategy – a centralized approach – when the BMP offers low potential for conflicts and the BMs can exploit synergy effects from one another by e.g. sharing of knowledge and resources (Markides & Charitou, 2004; Snihur & Tarzijan, 2018). When there are low (big) conflicts between BMs and they operate in different (similar/same) markets, Markides & Charitou (2004) suggest a phased separation (integration) strategy. In the case of a phased separation strategy a BM can exploit the experience and assets in an early stage before separating into an autonomous unit, because a further integration would hinder the BM's further development (Markides & Charitou, 2004; Puranam et al., 2006). The opposite is the case for the phased integration, in which the portfolio manager has to prepare the upcoming integration of the two BMs in the long term. In all four cases the portfolio manager has to implement the appropriate mindset to be fully successful with the strategy chosen (Markides & Charitou, 2004). However, the more complex and the more interdependencies exist within a BMP, the more difficult it is to imitate it. As a result, the company is able to gain a competitive advantage by building a BMP that is difficult to imitate, generates excess profits (Besanko et al., 2013; Snihur & Tarzijan, 2018) and exploits synergies.

Critical Review of Existing Frameworks. The resulting issue is that synergies between BMs in a BMP are critical to understand, yet current literature provides little guidance how to assess them. The literature provides diverse frameworks, but this work will only focus on the four most prominent: the BCG-Growth Share Matrix, the GE-McKinsey nine-box Matrix, the Business Portfolio Analyzer by Aversa, Haefliger & Reza, and the Business Portfolio Map by Osterwalder & Pigneur (see Table 1 and Appendix A for an overview of the graphical frameworks).

Frameworks / Criteria[6]	**BCG-Growth Share Matrix**	**GE-McKinsey Matrix**	**Business Portfolio Analyzer**	**Business Portfolio Map**
Authors	Henderson, BCG	McKinsey & Company	Aversa, Haefliger, Reza	Osterwalder & Pigneur
Year	1970	1970s	2017	2017
Theory	Diversification	Diversification	Business Model	Business Model
Strategic Intention	Facilitate investment decision-making process	Prioritization of investments among the different BMs	Maximize the complementarity of the entire BMP	Future strategic composition of the BMP
Strengths	1) Performance measurement of each BM 2) Facilitate divest or keep decisions	1) Transparent and structured mapping of the portfolio 2) Numerous individual criteria for the axis dimensions	Shows relationships between resources and capabilities of the various BMs and their impact on performance	Reflects risk of innovation and disruption → facilitate invest/divest decisions
Weaknesses	1) Market share is not a fitting benchmark anymore 2) Shows no synergies between BMs	1) No inter-connections between BMs 2) Selection, and evaluation of the axes based on subjective assessments	Difficult to display and monitor in large companies with numerous BMs	Fails to show synergies between each BM

Table 1: Comparison of frameworks in portfolio management theory

The *Growth Share Matrix* (Appendix Figure A2) is intended to facilitate the decision-making process by allowing companies to prioritize their different BMs. By assigning the individual BMs to the corresponding fields, decision makers should be confident about how capital and resources are to be distributed appropriately in order to create the greatest value and avoid possible losses (Barksdale & Harris, 1982; Reeves et al., 2014; Reeves & Moose, 2020). Following the BCG-Matrix, in the 1970s the GE-McKinsey-Matrix (Appendix Figure A3) came to light. It is designed to help companies with their investment decisions by displaying a map with nine areas, each with a unique strategy. Although the world has changed in recent years, both frameworks are still practical tools for measuring performance and making investment

[6] Notice: It is not a SWOT (Strengths, Weaknesses, Opportunities and Threats) Analysis. The criteria were selected according to the author's own standards.

decisions, but they do not reflect a portfolio's synergy effects. Furthermore, in the case of the BCG-Matrix, market share is not an appropriate benchmark for sustainable performance, as new drivers for competitive advantage, such as the capability to adapt to shifting circumstances, are more important nowadays (McKinsey & Company, 2008; Reeves et al., 2014). Aversa, Haefliger & Reza (2017) now try to close this gap with their *Business Portfolio Analyzer* (Appendix Figure A4). The concept aims to maximize the complementarity of the entire BMP. The relationships between the resources and capabilities of the various BMs and their impact on performance play a key role in this process (Aversa et al., 2017). However, this tool might not be the best fit for large corporations with a large number of BMs, as the illustration with arrows might complicate the model and interrelations would be difficult to see and monitor over time. Another model representing how to manage a BMP is the Business Portfolio Map (Appendix Figure A5) by Osterwalder & Pigneur (2017). This framework aims at the future strategic composition of the BMP. The objective of the framework is to protect the BM from possible disruption and further improve it to maximize profits (Osterwalder & Pigneur, 2017). As a result, it reflects all business activities in a single map and is able to make suggestions about future investment strategies, but it also fails to show synergies and interrelations within the BMP.

Consequently, the reviewed frameworks are feasible strategic alternatives to manage and monitor a multiple BMP, but they do not provide sufficient guidance on how to measure synergies. Above all, the lack of representation of interrelations between BMs makes it difficult to manage a portfolio in today's fast changing world.

2.2 Approaches to measure synergy effects

A synergy effect is often described as a positive outcome resulting from the mergers & acquisitions (M&A) or cooperation of two or more organizations, companies or BMs. However, there are often disagreements between individual BMs or also overvaluations of positive effects, or undervaluations of negative effects, which prevent the optimal exploitation of synergies, especially in the case of M&As (Dessein et al., 2010; Hofmann, 2005). Synergy effects are competitive advantages that are usually achieved through cost savings, e.g., through the joint use of resources, production facilities or distribution channels. Synergy effects can be differentiated according to operational functions: sales, operational, management and investment synergies (Casadesus-Masanell & Tarziján, 2012; KPMG, 2019) – which in turn are equivalent to the four pillars of Osterwalder & Pigneur's (2010) business model canvas (see section 2.1).

2.2.1 Qualitative methods to capture synergy effects

Identifying potential synergies becomes even more complicated if the BMs are not complementary but substitutes (Casadesus-Masanell & Tarziján, 2012). For this reason, it is all the more important to align and manage interdependencies in the portfolio, since this is ultimately the decisive factor for the performance of a company (Globocnik et al., 2020; Kaplan & Norton, 2006). Kaplan & Norton (2006) introduced the Balanced Scorecard to qualitatively measure synergies, facilitate the alignment of the existing BMP and serves as a concept for the implementation and development of corporate strategies. From the perspective of finance, customers, processes and development, critical success factors for a company are determined, which are important for the success of the overall strategy. Objectives, KPIs (key performance indicators), targets and measures are assigned to each of these perspectives. The financial perspective represents the point of view of the shareholders and investors and mainly represents a monetary view of the company. Key figures used here are, for example, gross profit, return on investment and profitability (e.g., increase in shareholder value or return on equity). In the customer perspective, the product and market performance are analyzed. Accordingly, KPIs such as market volume, customer satisfaction and delivery punctuality are of interest. The process perspective considers operations that are particularly important for the implementation of the corporate strategy. Key performance indicators such as unit costs in production, lead times, adherence to schedules or scrap production can be relevant as KPIs. The perspective of the development of the enterprise, or also called innovation perspective, deals with further development potentials and the personnel development of an enterprise. KPIs are e.g., process innovations, patent applications, the degree of fluctuation and the qualification level of the employees. Once objectives, KPIs and targets have been defined in the four perspectives, the measures found in the process now enable the implementation of the corporate strategy in everyday business. Likewise, the later achievement of objectives can be monitored and analyzed based on this framework. It is essential to take into account interactions between the individual perspectives to exploit synergies in the long run. The Balanced Scorecard thus enables an overview of the complex impacts of individual measures. In general, the formulated objectives are agreed upon with the employees of the departments involved. This ensures that on the one hand the targets can be realistically implemented and on the other hand the defined measures are accepted by the company's workforce. The Balanced Scorecard thus supports the company’s executives in developing all perspectives in a balanced way and in driving forward strategies holistically, without leaving parts of the company unnoticed (Cokins, 2010; Kaplan

& Norton, 2006; Webster & Cokins, 2020). Nevertheless, this concept lacks a certain standard because it is interpreted and ultimately implemented differently from company to company (Cokins, 2010).

2.2.2 Quantitative methods to measure synergy effects

In practice, firms use different approaches to evaluate synergies. The evaluation of strategies are particularly relevant when acquiring new BMs and companies. In this context, synergy potentials are thoroughly evaluated in the run-up to a M&A. Instruments from the financial sector, such as DCF (Discounted Cash Flow) analyses, benchmarking methods and comparison methods (multiples) are used to evaluate the synergy potential. The Net Present Value (NPV) resulting from the DCF analysis reveals the apparent profitability of the synergy potentials (KPMG, 2019). Benchmarking of synergies takes various aspects into account, such as a comparison with the NPV and operational and capital expenditures run rates estimated for comparable transactions, or the assumed increase in synergies over time. An exact determination of the net synergy value in the pre-merger phase is made particularly difficult by the limited availability of information about the target company (Hofmann, 2005; KPMG, 2019). In addition, the apparent profitability of the combined business is compared to that of competitors, taking into account the market position or size of the combined business and other relevant aspects (KPMG, 2019).

The thorough literature research reveals that the research area around synergies and portfolio management of BMs is still relatively new. For this reason, there is not yet a large number of frameworks that help to monitor a diversified company portfolio and, above all, to uncover synergy potentials when implementing a new BM. However, evaluation methods of synergy effects in a BMP are difficult to find in the technical literature. Due to the uncertainty and sometimes intangible or quantifiable form, the evaluation of synergies is a very difficult procedure. Against this background, this thesis sets out to develop a tool to facilitate the implementation decisions by taking synergy effects into account.

3 Methodology

3.1 Research design and methods

In the following, the existing literature is used in combination with practical content from the automotive industry to develop a tool to make strategic decision on the synergetic potential of a new BM. This serves as a basis for the prototype model and its testing in interviews with three industry experts. The automotive industry is perhaps more than any other industry in recent years in the focus of digital transformation, changes in the environment, regulation and customer preferences, and the emergence of many new market players (Andre et al., 2018; Fleming et al., 2019; Schnurrer et al., 2020; Walton, 2019). However, this is not to imply that this case cannot be transferred to other industries, as these issues are omnipresent in almost all industries. Therefore, this case serves rather as a sample case to demonstrate the practical applicability. This is illustrated by the example of a ride-hailing service for implementation in the BMW portfolio.

The strategic intent of the model is that a portfolio manager can more easily make decisions about the integration (separation) of a new BM into (from) the existing company portfolio. The model should therefore capture synergies between the new BM and the existing portfolio and qualify these binary choices in figures. Using an example, the prototype is field-tested in interviews with industry experts in order to help creating the final framework. Therefore, a combination of a top-down and a bottom-up approach is chosen as the basis and input for the framework, as shown in Figure 1.

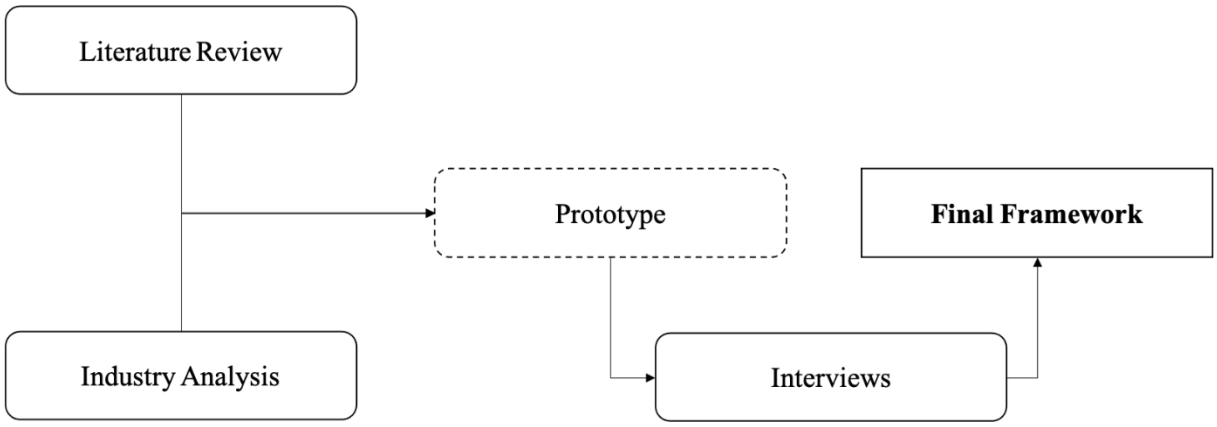


Figure 1: Research approach

For this work, books, academic papers, newspaper articles, reports and company websites were reviewed and analyzed. The reports were provided by consulting firms such as PricewaterhouseCoopers (PwC), Strategy&, Accenture, Deloitte, KPMG, McKinsey &

Company, and Oliver Wyman, and the European Automobile Manufacturers Association (ACEA), representing Europe's car, bus, van and truck makers. These well-established and leading consultancies give reason to believe that the reports provide valuable insight to assess current market developments in the automotive industry.

In order to test the BPSA and gain a little insight into the usual portfolio management decisions at a major car manufacturer, three semi-structured interviews were conducted with BMW employees (see Table 2). More specifically, two employees were selected who have a close relationship to management decisions in the area of CASE driving and one employee who has accompanied a project similar to the example discussed above in development for BMW in China. Their hands-on experience with portfolio management decisions and, in the case of the third interviewee, full involvement in an ride-hailing-related project in China, give reason to believe that the interviews were a valuable source of information to test the applicability of the model. Semi-structured interviews are an appropriate tool for gaining access to respondents' personal opinions, understandings, explanations, and very unique stories (Adams, 2015; Sovacool et al., 2018). The interviews were forced by the current pandemic conducted via video calls and lasted 55-105 minutes. Each interview was recorded and all responses to the 21 questions were recorded in writing.

	Interviewee 1	Interviewee 2	Interviewee 3
Company	BMW	BMW	BMW
Position	Technical Project manager in pre-development	Technical product manager	Software developer
Business Line	Original Design Manufacturer; Connected Drive	Autonomous Driving	Autonomous driving
Work Experience	> 10 years	> 5 years	> 10 years
Type	Video Call Interview	Video Call Interview	Video Call Interview
Duration	60 minutes	105 minutes	55 minutes

Table 2: Interview characteristics

The core statements of the expert interviews are shown in Appendix Table C1. The next subsection will more explicitly discuss the summarized results of the interviews in relation to

the BPSA. Nevertheless, a few facts are briefly summarized here, most of which deal with standard practices in portfolio management at BMW.

The first question revolved around potential conflicts. It quickly became clear that there are plenty of conflicts between the individual business units in a large automotive group like BMW. Three main issues clearly emerged: 1. classic car manufacturing vs. CASE driving; 2. pre-development research vs. series development research; and 3. managers vs. sales. This is mainly due to the different mindsets of the respective departments and the encounter of different cultural and age groups, especially if one compares classic car manufacturing with topics related to CASE driving. While unfinished products are conceivable with CASE topics (e.g. software of the infotainment system), it is unthinkable to launch an unfinished product on the market in classic car manufacturing. Thus, product quality, market maturity and scalability are frequent points of contention in portfolio management decisions.

The experts have been asked which tools are used for decision-making in portfolio management at BMW. This revealed that the methods used throughout the organization differ in some areas, but that classic models such as the BCG matrix or the GE-McKinsey matrix are no longer used, at least not in CASE departments. However, the most widely used tools are agile product/software development in conjunction with Scrum Masters. Scrum is a process design of project and product management, particularly for agile software development. The Scrum Master functions as a kind of coach or mentor, who is supposed to increase the production of the team members and prevent possible conflicts. The agile product development methods consist of several sprints, which means that only short-term development goals are ever set (at BMW, these are 2-week cycles) and the goals are refined through constant testing.

In summary, the literature review helped to find basic categories to assess synergies, the industry reports helped to assess which criteria should be taken into consideration for the automotive industry specifically, and the interviews helped to verify the model with a concrete example.

3.2 Introduction of the Business Portfolio Synergy Analyzer

The objective of the framework is to facilitate the decision-making process of a portfolio manager by reflecting synergies between the possible new BM and the existing business portfolio, therefore it was named “Business Portfolio Synergy Analyzer” (BPSA). The model uses a combination of different theories to simplify the decision on whether to integrate into the

portfolio or to separate from it. To summarize this framework serves the following three purposes:

- To demonstrate synergies in qualitative form
- Demonstrating synergies in quantitative form
- Making a quick strategic decision based on the degree of fit.

Before using the BPSA, a portfolio manager must have taken typical management decisions to develop a new BM – e.g., can the new BM be profitable, does it fit the company's strategic agenda, can it enhance the company's brand value, diversify horizontally or vertically. After that, the BPSA comes into play. The BPSA consists of five fields of analysis (see Figure 2), in detail - diversification effects and the four pillars of business models, created by Osterwalder & Pigneur (2010).

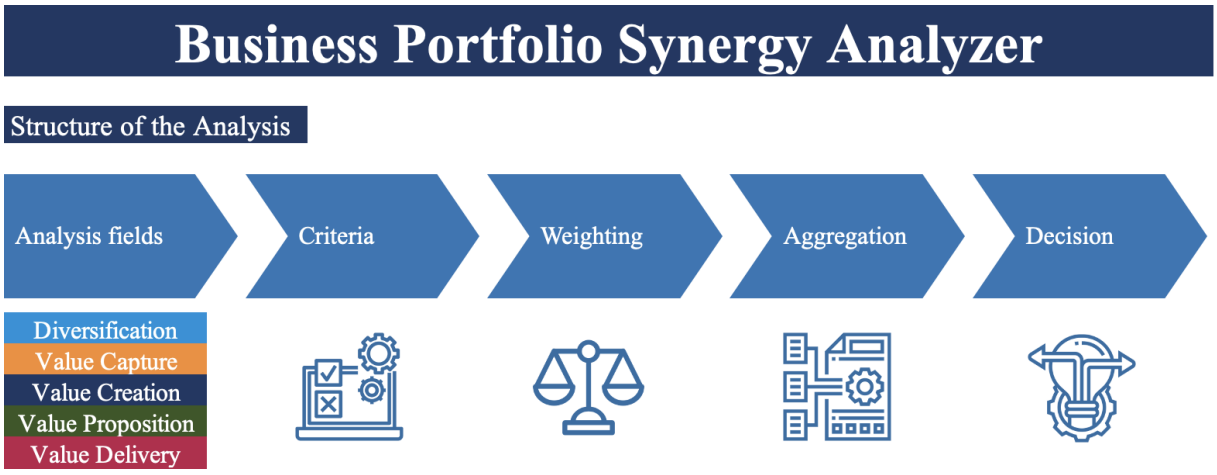


Figure 2: BPSA - structure of the analysis

Step 1. First, the portfolio manager has to set the scope and be aware of what the new BM should look like and what kind of resources and capabilities are needed to launch it. In the following the manager evaluates the individual criteria for the associated analysis fields for himself. In the case of diversification effects, only geographical aspects are taken into account, since the decision to diversify horizontally or vertically was already made in the development process of the new BM (see Figure 3). At this stage, the manager evaluates in which markets an implementation of the new BM would be feasible, taking into account the time scope. The focus is placed on local, national, continental or global implementation.

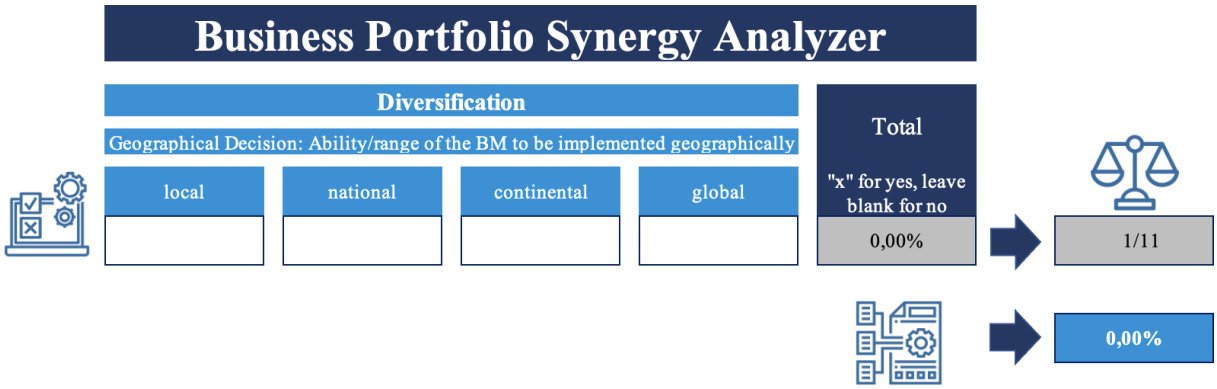


Figure 3: Analysis diversification effects

Step 2. Subsequently, the four pillars of Osterwalder & Pigneur (2010) with the corresponding fields from their nine building blocks are analyzed for their synergetic potential with the existing portfolio. In the value capture analysis, a decision is made in which cost, revenue, and partnership areas synergies can be realized. Figure 4 shows a first example for the automotive industry, which in turn can easily be adapted to other industries by changing the criteria.

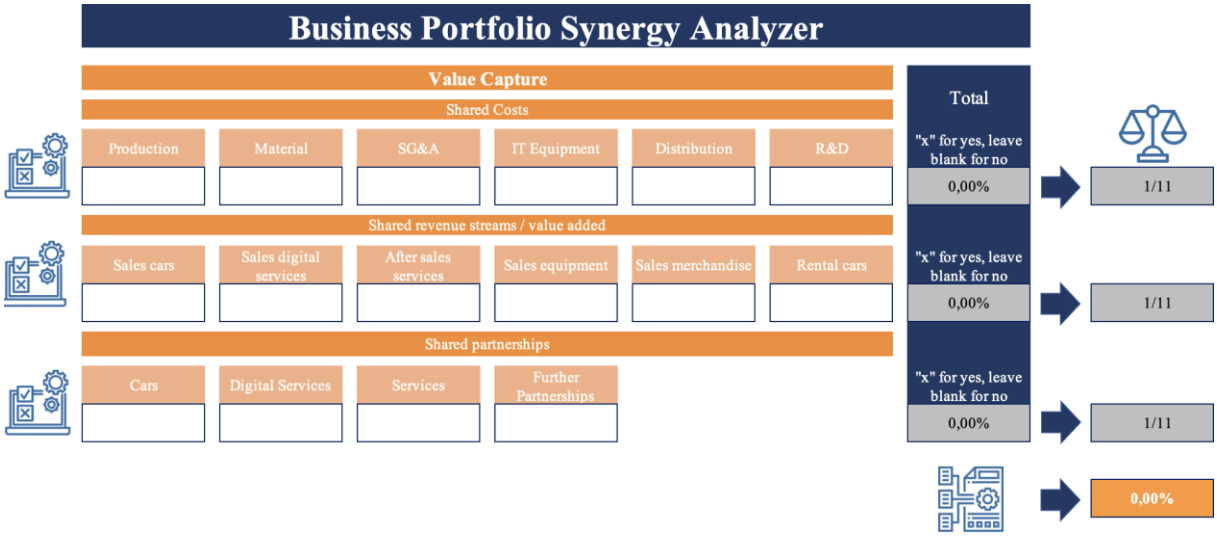


Figure 4: Analysis value capture

Step 3. Figure 5 shows the analysis of the value creation process. At this point, the portfolio manager makes decisions as to what percentage of the required workforce can be taken over from other departments. In addition, a decision must be made as to how strongly the new BM should be integrated into the existing network, i.e. which data and information links can be used. Furthermore, the manager determines a percentage that indicates the degree to which existing technology in the group can be used for the new BM, in other words, he must be clear about how much business model-specific technology is required.

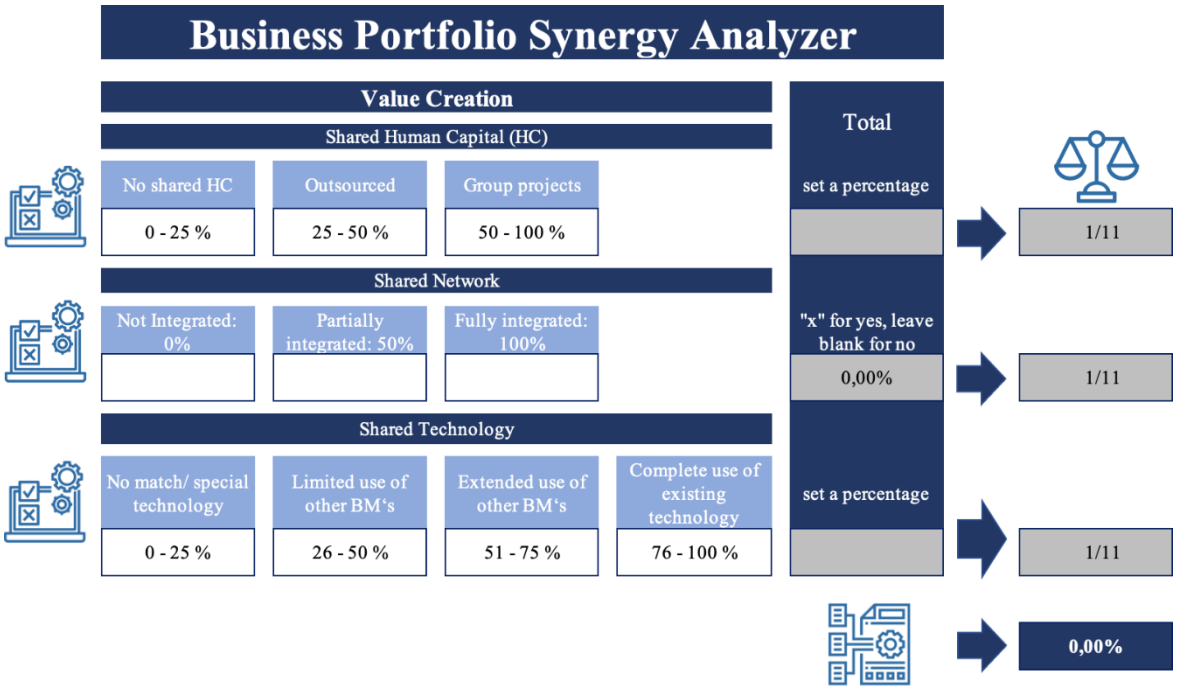


Figure 5: Analysis value creation

Step 4. The analysis of the value proposition is shown in Figure 6. To simplify the illustration, the example of the automotive industry was again used and only two main activities were considered. Once again, the portfolio manager sets a percentage or ticks off fields of synergetic potential with the existing portfolio. The model can also be transferred to other industries by slightly adapting the criteria.

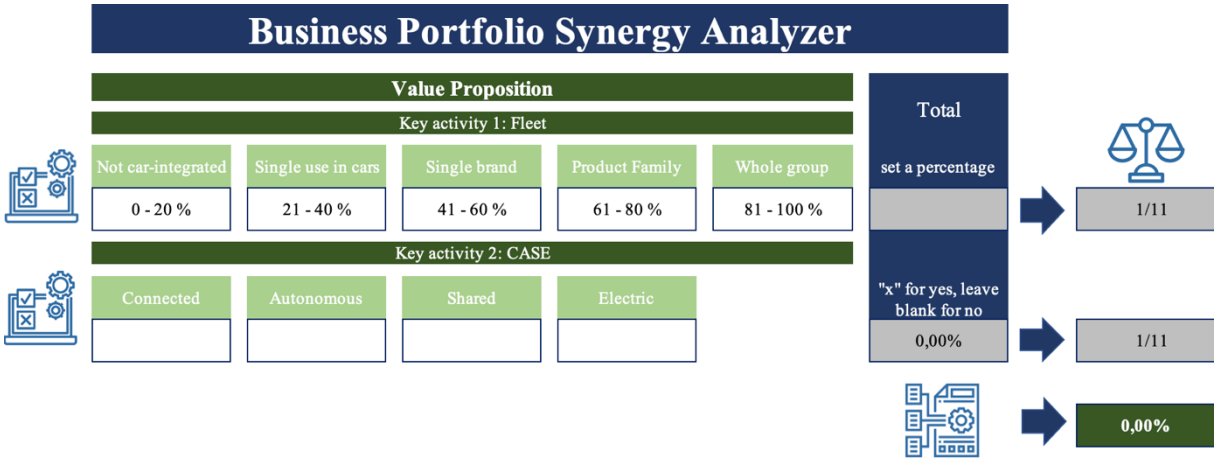


Figure 6: Analysis value proposition

Step 5. In the last analysis (value delivery), the different customer groups and sales channels of the existing portfolio are compared with those of the new BM, taking into account the time scope. Figure 7 shows only one automotive-specific criteria with the customer type, but apart from that the model is easily adaptable for other industries.

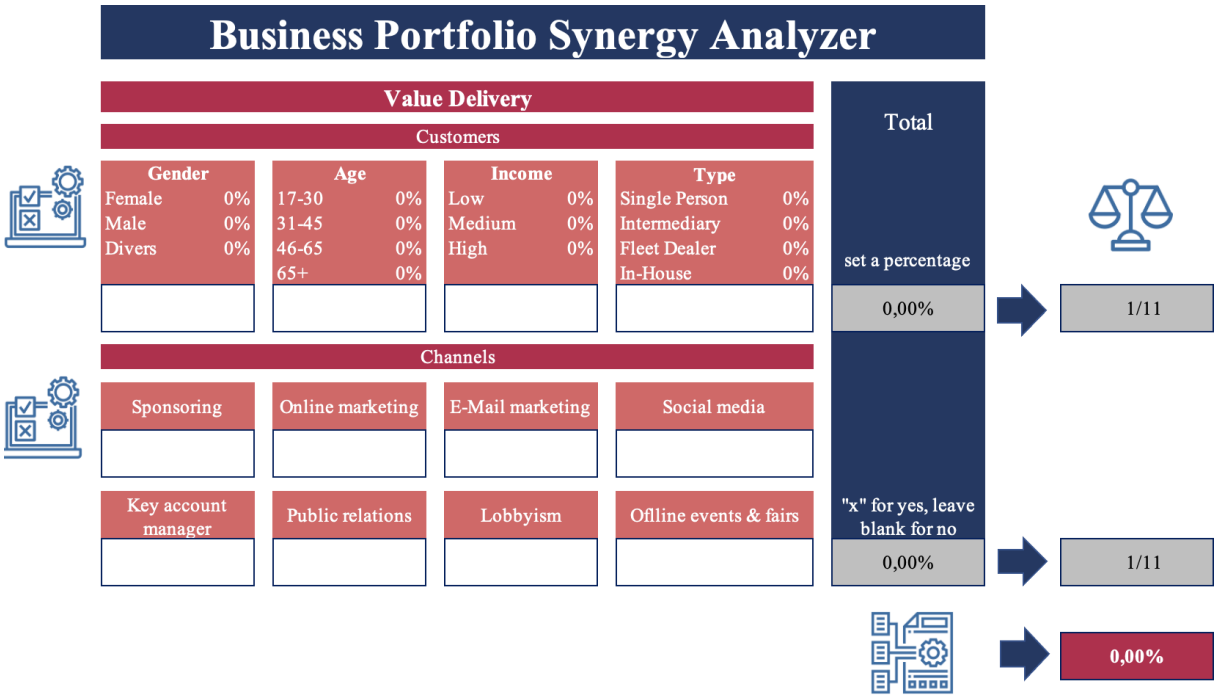
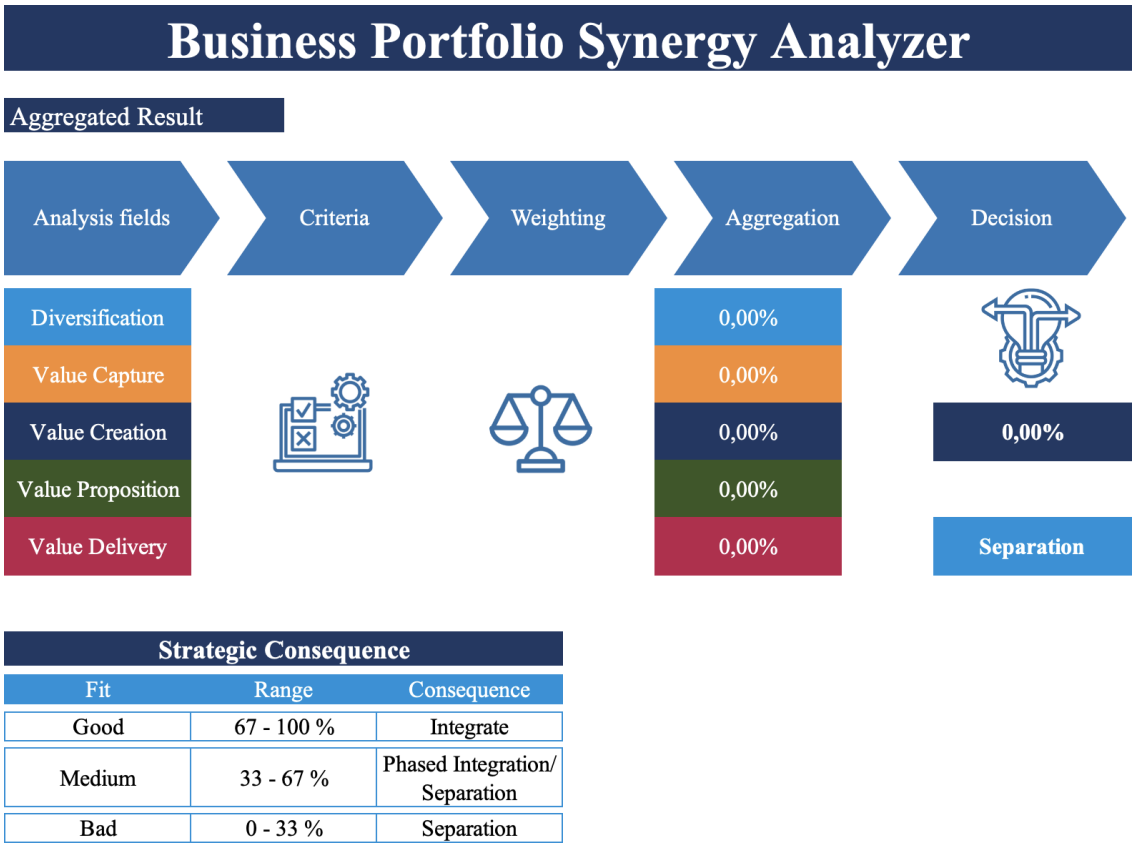


Figure 7: Analysis value delivery

Step 6. The portfolio manager now determines a weighting for each criterion. In this example every criterion is equally weighted. The weighted sum of the individual criteria then results in a percentage that expresses the overall synergy effect (see Figure 8). This overall synergy effect then decides, with the help of Markides & Charitou's (2004) model, whether the BM should be integrated into or separated from the business portfolio (or phased-integrated/phased-separated).

In the next chapter, this model is put to the test with an example in three interviews with industry experts from BMW.



Strategic Consequence		
Fit	Range	Consequence
Good	67 - 100 %	Integrate
Medium	33 - 67 %	Phased Integration/ Separation
Bad	0 - 33 %	Separation

Figure 8: BPSA result and strategic consequence

4 The BPSA applied to the case of BMW

4.1 Case context

4.1.1 Existing versus new business models in the automotive industry

Now that the first foundation stone for the creation of the prototype has been laid with the literature review, the next two subchapters form the second elementary part with a focus on the development of the industry from the past to the present. In addition, it attempts to give an outlook on possible future developments.

Until recently, only a few OEMs dominated the automotive industry. Innovations were predominantly hardware-based, or in the logistics value chain. Moreover, BMs and sales practices with ownership and intermediaries have largely been spared disruptive developments for decades (Tian et al., 2016; Wells, 2015). At the heart of value capture is still a product-service package composed of all-steel bodies with internal combustion engines (ICE), which are supplied to end customers alongside warranty and after-sales services. Markets are categorized by different vehicle classes and types in order to reach various types of customers. OEMs traditionally achieve their value creation through the creation of internal capabilities such as vehicle body manufacturing and assembly (Wells, 2015; Zöbelein et al., 2020), along with procurement systems that align and manage both global supply chains and local clusters (Wells, 2015).

Cars have been equipped with more and more features to make them cleaner, safer and smarter (ACEA, 2020b). This trend is especially true for the emergence of CASE driving. Brook & Pagnanelli (2014) identify sustainability on three different levels (ecological, social and economic) as the main force to push innovation in the automotive industry. Sustainable and digital technologies will reduce CO2 emissions further and lead to even more efficient use of resources in the long-term (Bohnsack et al., 2014; Hanelt et al., 2015). Even though market entry is quite difficult due to high entry barriers in industries that are particularly dependent on fossil fuels, a trend towards electrically powered vehicles is becoming more apparent (ACEA, 2020b; Bohnsack et al., 2014). This is partly due to the greater variety of suppliers, for example new entrants such as BYD, Nio or BAIC (Bay, 2019), partly to the incentives offered by governments to purchase electric cars (ACEA, 2020a) and partly to rapid changes in customer preferences (Fleming et al., 2019; Hanelt et al., 2015; Schnurrer et al., 2020).

However, innovation is still a major part of the industry’s DNA. The EU's €60.9 billion investment in research and development (R&D) is by far the leader in the automotive sector

compared to other regions in the world. Even within the EU, no other sector invests as much money in R&D as the automotive sector (market share: 29%) (Hernandez Guevara et al., 2019). Thus, it can be observed that the automotive industry is undergoing an extreme change, Yin et al. (2017) even speak of a paradigm shift. Digital technologies enable significantly faster service and product innovations, shorter product lifecycles, and cross-industry disruptions (Hanelt et al., 2015). Even in industries that were predominantly physical, there is an increasing need to revise their BMs and make the implementation of digital solutions a central issue (Hanelt et al., 2015). Especially the traditional OEMs are facing these disruptions from other industries. Threats are posed by consumer electronics manufacturers (e.g. Apple), software companies (e.g. Google, Amazon), peer-to-peer service providers (e.g. Uber, Bolt) and BEV manufacturers (e.g. Tesla, Nio) (Peters et al., 2016; Tian et al., 2016; Walton, 2019; Yin et al., 2017). This array of radical innovations in the areas of CASE driving can lead to a displacement of entire value chains, ecosystems or the incumbents (Hanelt et al., 2015; Yin et al., 2017) and moreover lead to a tough contest for the best talents (Schnurrer et al., 2020). According to Hanelt et al. (2015) digital transformation is therefore triggering different steps of BM change (as illustrated for the automotive industry in Appendix Figure B6) (Hanelt et al., 2015). The car is therefore transformed into a mobile computer on the road and the meaning of transportation evolves to a more individualized mobility service (Yin et al., 2017). OEMs are now facing various dilemmas to survive these paradigm shifts. First of all, the focus of investment must be defined to enable sustained growth, although it is difficult to determine which innovation will be disruptive (Brook & Pagnanelli, 2014; Yin et al., 2017). Nevertheless, the secret to competitive advantage resides in these disruptive innovations (Bohnsack & Pinkse, 2017). Next, the company must estimate how quickly to react, since a paradigm shift and the adaption to it takes time (Brook & Pagnanelli, 2014; Yin et al., 2017). Finally, OEMs must weighed up to what extent coordinated efforts from the entire ecosystem make sense, or where and to what extent to cooperate and/or compete with rivals (Yin et al., 2017).

Connectivity in vehicles is becoming more and more important as customer demand for driving-related applications and services offered by car-to-infrastructure, car-to-car and communication technologies embedded with the Internet of Things[7] (IoT) continues to grow (Yin et al., 2017). This increasing demand for more in-car entertainment/experience and information is not completely disrupting the traditional way of manufacturing cars, but by just adding digital

[7] Internet of Things: The IoT describes technologies that make it possible to network physical and virtual objects with each other and make them work together through information and communication technologies.

features the OEMs make their cars more compatible to the digital world (Hanelt et al., 2015). This has led to a change in people's current view of the car. While in the past the role of the car was characterized as a status symbol, in today's world it is seen as a tool for digital experiences (Hanelt et al., 2015; Yin et al., 2017). Digital technologies, especially big trends around cloud computing, big data, mobile technology and, social media enable opportunities for OEMs creating mobility services without customers even owning a vehicle at all (Hanelt et al., 2015; Riasanow et al., 2017; Tian et al., 2016). Consequently, OEMs have to develop or purchase competencies in these areas. The vast amounts of data that arise in connection with connectivity help to optimize processes and value capture strategies.

The next case in which OEMs need to consider a BM revision is autonomous driving, as this area needs a lot of innovation and new technologies (Hanelt et al., 2015). However, autonomous driving is still not fully mature, since of the possible five stages (created by Society of Automotive Engineers (SAE), Table 3), no provider has yet been able to release a car of the highest level (full driving automation) onto the road (Hartwig, 2015). An indication that level 3 and 4 will soon be ready for the market could be BMW's announcement that all board members will take at least one test drive in the respective stages by Christmas 2020 (Hohensee, 2018). Another indicator of the EU's innovative strength is the number of patents for autonomous vehicles, which currently accounts for a third of all applications worldwide (ACEA, 2020b). In spite of these innovations, the public in particular must be sensitized to autonomous driving, since many issues such as ethical questions in the event of accidents, regulatory frameworks, insurance conditions and IT and data protection issues must be clearly defined and clarified beforehand. Nevertheless, autonomous driving offers many positive possible outcomes, such as fuel savings, time savings, safety gains, a reduction of urban parking spaces and positive spatial effects for poorly accessible non-urban locations (Esser & Kurte, 2018; Hartwig, 2015).

SAE - Level	**Step Name**	**Description**
Driver monitors the driving environment		
Level 0	No Automation	Takeover of the dynamic driving functions completely by the driver
Level 1	Driver Assistance	Steering or braking/accelerating in certain driving situations by a driver assistance system

Level 2	Partial Automation	Steering and braking/acceleration in specific driving situations through a driver assistance system
Automation system monitors the driving environment		
Level 3	Conditional Automation	All aspects of the dynamic driving task are taken over by the automation system in certain driving situations, driver reacts appropriately to the request to intervene
Level 4	High Automation	All aspects of the dynamic driving task are taken over by the automation system in certain driving situations; even if the driver does not react appropriately to the request to intervene
Level 5	Full Automation	Complete takeover of all aspects of the dynamic driving task by the automation system in all driving situations

Table 3: Levels of autonomous driving

Due to the rural exodus and the ever-increasing number of large cities, environmental pollution issues and ever-decreasing availability of inner-city parking spaces have become a problem that mobility services and car-sharing offerings also seek to solve. Owning a vehicle is now perceived as an inconvenience and a restriction of personal freedom (Brook & Pagnanelli, 2014; Hanelt et al., 2015; Tian et al., 2016; Wells, 2015; Yin et al., 2017). The smartphone becomes the cornerstone of the user's physical mobility experience, e.g., by guiding them to nearby transportation facilities, booking and paying, or even opening doors of sharing vehicles (Hanelt et al., 2015; Tian et al., 2016). This means a radical transformation for car manufacturers from a transactional, product-based system to BMs with usage-based payment. For the automotive industry, this could imply a shift in what is perceived as fundamental to competitiveness (Hanelt et al., 2015). As OEMs are increasingly dependent on external service providers from other mobility industries or IT companies offering mobility planning applications for integrated mobility services, companies' strategy is shifting towards an open ecosystem and multiple BMs with various partnerships (Hanelt et al., 2015; Tian et al., 2016). Furthermore, the usual industry production cycles of five to eight years for vehicle models could soon be a matter of the past (Kuhnert et al., 2018; Weber et al., 2018). Reports from Strategy& and PwC estimate that by 2030, the time between R&D and production will drop to one to two years to keep pace with technological advances in software and hardware (Kuhnert et al., 2018; Weber et al., 2018). As most consumers are understandably not willing or financially able to buy the latest model every

year, the shorter innovation cycles will be particularly relevant in shared mobility markets (Kuhnert et al., 2018).

In 2019 10.6% of new passenger cars in the EU were alternatively fueled instead of diesel or petrol fueled. Compared to 2016, where just 4.2% of new registrations were alternatively fueled (e.g. electric, hybrid-electric, biodiesel, bioethanol, hydrogen fuel cells), there is a clear trend towards environmentally friendly fuels (ACEA, 2020b). This is partly due to the monetary and regulatory incentives issued by governments to invest more money in the production and innovation of electric vehicles (Bohnsack et al., 2014; Fleming et al., 2019). Pioneers in the electric vehicle industry are above all novel, entrepreneurial companies that have found innovative ways to overcome typical disadvantages of electric vehicles (i.e., high costs, short range and long charging times), and to generate added value for their customers by providing major innovations in their BMs (Bohnsack et al., 2014; Wells, 2015). Electric powertrain systems offer greater efficiency in energy consumption, emit fewer emissions and enable new car designs (Fleming et al., 2019; Yin et al., 2017).

In summary, innovation can be achieved on the product and business model level. CASE driving also highlights the increasing relevance of digital skills for traditional automotive manufacturers in order to be able to offer various products and services and that a restructuring towards a customer-focused BM must take place (Seiberth & Gründinger, 2017; Walton, 2019). In this fast-changing industry it is essential to establish an ecosystem (Bentenrieder et al., 2017; Tian et al., 2016; Walton, 2019; Yin et al., 2017) and to find the right partners to collaborate, as no incumbent is able to compete in all areas and to find a way to be a part in the customer's everyday digital life (Bentenrieder et al., 2017; Gyimesi & Berman, 2011; Hirsh et al., 2019; KPMG Automotive Institute, 2020; Schnurrer et al., 2020; Smeets et al., 2019). It is essential to rework development processes and establish capabilities in multiple digital areas (Bentenrieder et al., 2017). Certainly, a change or a spreading of the focus to several business areas can lead to their mutual cannibalization (Bohnsack & Pinkse, 2017), but there is still the possibility to create synergies from these transformations in order to further increase the enterprise value. BMW's iVentures can certainly be highlighted as an example from this point of view. Through this venture capital firm, BMW gets a good overview of the entrepreneurial, purpose-driven landscape and can thus invest in new trends in the automotive industry and gain new knowledge at an early stage.

4.1.2 BMW’s business model portfolio as of 2020

The BMW Group, with its BMW, MINI and Rolls-Royce brands, is the world's leading premium manufacturer of automobiles and motorcycles (global sales: approximately 2.5 million automobiles & 175,000 motorcycles) and provider of premium mobility and financial services. The consolidated net profit for the year amounted to more than 5.0 billion euros. As of December 31, 2019, the company employed more than 130,000 people worldwide (BMW Group, 2020). As an international group, the company operates 31 production facilities in 15 countries (BMW Group, 2020). This powers the BMW Group as the ideal case for this thesis.

The electrification of the product line is also having a clear impact on the company’s strategy. At the end of 2019, the BMW Group had half a million electrified vehicles in circulation. With its broad range of electrified vehicles, the company is meeting the needs of customers and thus making a contribution to effective climate protection. Long-term thinking and responsible action have always been the basis of the BMW Group's economic success. The company has firmly anchored ecological and social sustainability along the whole value chain, extensive product responsibility, and a clear commitment to conserving resources in its strategy (BMW Group, 2020). This is underlined in particular by the BMW Group's early entry into more innovative markets such as the electrification of vehicles, offering mobility services (“DriveNow”, now “ShareNow”), huge engagement in autonomous driving and early investment in CASE projects with its venture capital fund “BMW iVentures”, founded in 2011.

According to the 2019 annual report (BMW Group, 2020), BMW plans to be able to realize over twelve billion euros in efficiency potential by the end of 2022 with their NEXT performance program. For example, they are consistently digitizing all possible processes. In 2019, 6.4 billion euros were spent on R&D. Already, almost all series have been renewed in the past two years (BMW Group, 2020). In 2020, many innovations followed, such as new powerful BMW M models, new plug-in hybrids and e-models. In 2021, the long-awaited all-electric iX3, i4 and iX models will be launched. The automotive portfolio is thus newer and technologically broader than that of many competitors. In addition, the BMW Group serves all market segments with its other brands MINI and Rolls-Royce. Its plants can flexibly produce all powertrain types. By 2021, a quarter of the new car fleet in Europe are expected to be electrified, and by 2030 as much as half. Under the Alphabet brand name, the BMW Group offers cooperation partners in the international cross-brand fleet business fleet financing for key accounts and comprehensive management of corporate fleets in 31 countries. Supporting the dealer organization by financing the vehicle fleet at dealerships rounds off the segment's range

of services. In developing new technologies, the BMW Group focuses on the topics of low-emission drive systems, digitalization and autonomous driving (BMW Group, 2020; Zöbelein et al., 2020).

Connected. One of the most significant impacts of digitalization in the automotive industry is that the vehicle itself is becoming the hub of the digital customer experience. With BMW Connected and its growing range of digital offerings, the BMW Group prepared for this at an early stage, putting its customers at the center of a contemporary mobility offering (BMW Group, 2020; Tian et al., 2016). Digital services are to be made available to customers seamlessly and without restrictions, even outside the vehicle. This includes, for example, personalized and contextual information in the automobile. Customers can also keep their vehicle digitally up to date throughout its entire lifecycle and adapt it to their individual wishes (Tian et al., 2016; Zöbelein et al., 2020). With the Remote Software Upgrade, the vehicle can be kept up to date with the latest software, features are continuously expanded, and digital services can be added at a later date. In this way, the quality and safety of the vehicle are continuously improved. With digital services such as digital charging services or on-street parking, which can be booked later via the BMW ConnectedDrive Store, it has been possible since 2014 to continually adapt the car to personal preferences. The BMW Group's expanded, customer-centric digital offering means that customers do not have to commit to specific optional extras at the time of purchase, but can continually adapt them to individual requirements over time (BMW Group, 2020; Zöbelein et al., 2020).

Autonomous. The BMW iX, the BMW Group's first highly automated vehicle, will be launched in 2021. The iX will enable the driver to hand over the driving task to the car for longer periods of time on authorized highways and highway-like roads and, depending on the regulations, perform secondary driving tasks. Since 2018, the BMW Group has been bundling its development competencies for state-of-the-art driver assistance systems in a dedicated development center. The goal is “an open platform for highly and fully automated driving” (BMW Group, 2020, p. 28). Already today, driver assistance systems support customers in the vehicle in various driving situations. In July 2019, the Daimler AG and BMW Group signed a deal on a long-term strategic cooperation on autonomous driving. Both corporations intend to collectively develop new technologies of driver assistance systems and autonomous driving on highways, as well as automated parking functions (BMW Group, 2020; Zöbelein et al., 2020). Cooperations with other innovative partners will also be sought in vehicle development. In this way, they aim to develop an open industry standard for highly and fully autonomous driving

("non-exclusive industry platform"). In July 2019, they signed a cooperation contract with Tencent to create the BMW Group China High Performance D3 platform. With the help of this platform, the BMW Group will develop autonomous driving technologies and products to meet the complex local traffic conditions (Zöbelein et al., 2020).

Shared. Knowledge of customer needs forms the basis for offering an attractive and comprehensive range of mobility services. These include, for example, uncomplicated, digital mobility services that also include drop-off and pick-up services or help customers find free parking spaces in metropolitan areas (BMW Group, 2020). BMW responded to increasing urbanization and the emerging trend of shared ownership with a joint venture with Sixt, the car sharing service DRIVE NOW. The concept is a simple all-inclusive service (insurance, tax, fuel, and parking costs) (Bohnsack & Pinkse, 2017). To strengthen this strategic area, the company has joined forces with Daimler to establish the joint venture YOUR NOW, using only the electric model BMW i3. The two companies are thus driving forward the vision of autonomous on-demand and all-electric mobility. The new mobility offering is to be easily accessible, intuitive and customer-centric. In this context, the existing on-demand mobility services in the fields of ride-hailing, car-sharing, charging, parking and multimodality have been brought together for further strategic expansion in the future. The cooperation includes the joint ventures FREE NOW (cab service, ride-hailing), SHARE NOW (car-sharing; merger of DRIVE NOW and car2go), CHARGE NOW (charging), PARK NOW (parking) and REACH NOW (on-demand mobility and multimodality). YOUR NOW further offers innovative solutions for communities that want to improve the efficiency and sustainability of their mobility. Since BMW, Daimler and AUDI acquired the HERE mapping service in 2015, the strategic partners have been collaborating on highly accurate digital maps that can be linked to real-time in-car data. The digital maps create the foundation for future forms of mobility and location-based services. Among other things, they lay the foundation for new assistance systems (BMW Group, 2020; Zöbelein et al., 2020).

Electric. With 13 electrified (plug-in hybrid and fully electric) models (as of 2020), the BMW Group is one of the world's leading suppliers in the field of electromobility. In its home market, Germany, the company has been the market leader for electric vehicles since 2016 and also has been in a top position in Europe and worldwide. Thanks to its many years of experience, the corporation has a broad and in-depth knowledge of electromobility. Based on that, the BMW Group develops the powertrain technology such as the engine, the power electronics and also the battery itself (Zöbelein et al., 2020). To give drivers a greater sense of security never running

on empty, BMW has installed dashboards in all of their electric vehicles that provide feedback on the driver's driving style and the conditions of the environment to enable the most efficient travel possible (Bohnsack & Pinkse, 2017). At the European level, they have set up a high-performance fast-charging network along important transport axes with the joint venture IONITY (participating partners: BMW, Ford, Hyundai, Mercedes-Benz, Volkswagen, Audi, Porsche). These will enable charging up to seven times faster than standard 50 kW stations. This means that suitably equipped vehicles can be charged in ten to 15 minutes (Zöbelein et al., 2020).

4.2 Application of the BPSA

4.2.1 A sample new BM for BMW: eRideNow

In order to discuss the BSPA with the interviewees the portfolio of BMW was analyzed for any "missing" projects in the area CASE driving. As mentioned earlier, BMW has a strong focus on autonomous, electric and connected driving. This leaves a somewhat smaller gap in the area of shared driving despite the joint venture with Daimler, YOUR NOW. Mobility services like FreeNow do have the advantage of offering ride-hailing services, but a more environmentally friendly alternative is still lacking, as BMW is also very committed to sustainability. For this reason, it's worth taking a look at a major competitor, one of the world's largest automakers, Volkswagen (VW). With MOIA, VW offers a ride-hailing mobility service in the transport segment between bus and taxi. So far, the service is operated with electric minibus vehicles in the German cities of Hamburg and Hanover. The focus of the BM is clearly on environmental awareness and thus aiming to relieve city centers from traffic jams and air pollution from combustion engines. The minibuses also offer comfortable privacy seats, Wi-Fi and USB connections. MOIA transports up to six people in one vehicle and the app shows the expected arrival time and costs for the ride in advance. It offers up to three rides, from which one can choose the best one for oneself. These can differ in pickup and arrival time and price (MOIA GmbH, 2020).

The idea is to design a MOIA-like service with the appropriate adaptations to the BMW portfolio (for this purpose called "eRideNow"). In consultation with the first interviewee, we have decided in a pre-interview on the all-electric SUV models, which will be released in 2021, featuring the "iX" and "iX3" models. Likewise, they offer the highest levels of comfort, luxury and connectivity and are variably customizable. In addition, they have a high range (458 & 600 km), making a day on the road possible without any or longer charging stops. Furthermore, we

agreed on a two-year scope to get a proof-of-concept for such a BM, which of course involves high upfront costs. However, all of these assumptions made were maintained for the other two interviews.

4.2.2 Results of applying the BPSA to eRideNow

In this part, the average results of the interviews when applying the BPSA and what justifications the experts had for the respective classifications will now be discussed.

Expert application of the BPSA. First, we take a look at the geographic diversification effect (Figure 9). The experts unanimously assessed that for the assumed time scope of two years, an introduction of the eRIDE NOW BM is possible at most at the local and national level. The rationale for this was that one usually starts with such BMs on the domestic market, since it is known best (from a customer needs and regulatory perspective) and certain prerequisites have already been created by similar BMs in the portfolio (e.g. YOUR NOW).

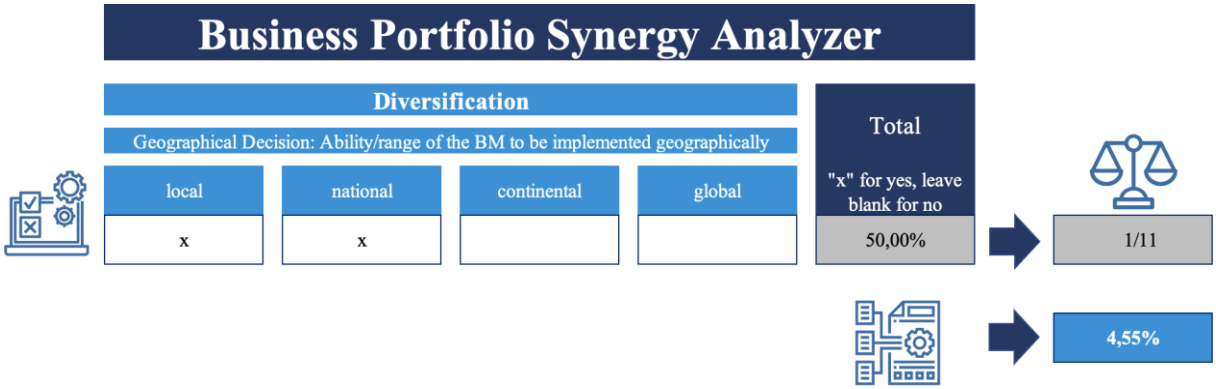


Figure 9: Result diversification effect

The value capture analysis looked at possible shared costs, revenues and partnerships (Fig. 10). The experts were of the opinion that economies of scale can occur in production, material costs and the costs of IT equipment in particular due to an increased number of cars to be produced (in this case the iX). Synergy effects can also be exploited in the area of R&D. The company receives more information from its (potential) customers. In addition, R&D activities for the specific BM can also be relevant for other business units (e.g. YOUR NOW or by evaluating on-road data for software and hardware improvements). Especially the multitude of sensors and technology for autonomous driving, and this goes hand in hand with the literature (Telang et al., 2019), account for a large part of the costs in R&D. For this reason, ride-hailing services are extremely suitable for saving/sharing costs and increasing the usage rate of the technology in order to ultimately perfect it (Telang et al., 2019). In addition, synergies can arise in various selling, general & administrative expenses (SG&A) (e.g. accounting, rent, salaries). When

looking at sales, there are rather contrary results to the literature. The literature (e.g. Bohnsack & Pinkse, 2017) fears cannibalization effects for mobility services and traditional automotive manufacturing. However, exactly the opposite is the case. Internal studies of BMW seem to rather prove a positive synergy effect between such BMs. For this reason, eRIDE NOW can also boost the sale and rental of cars and vice versa. Moreover, the respective digital services push each other by creating an ecosystem that strengthens customer loyalty. The interviewees saw no special links in the areas of after sales services, sales equipment and sales merchandise between eRIDE NOW and the existing portfolio. Partnerships are indispensable for the design of such a BM. Consequently, in the area of digital services, existing partnerships are used for software development. In addition, partnerships are extremely important in areas such as fleet management and the procurement of drivers, as these are huge cost blocks in this example and could not be covered in-house. The criterion cars, in shared partnerships, was debated critically. Under certain circumstances, a partnership with Daimler, for example, could again come into question if, at some time in the future, they wanted to have minibuses on the road in order to be able to transport even more people, since BMW does not manufacture such vehicles itself.

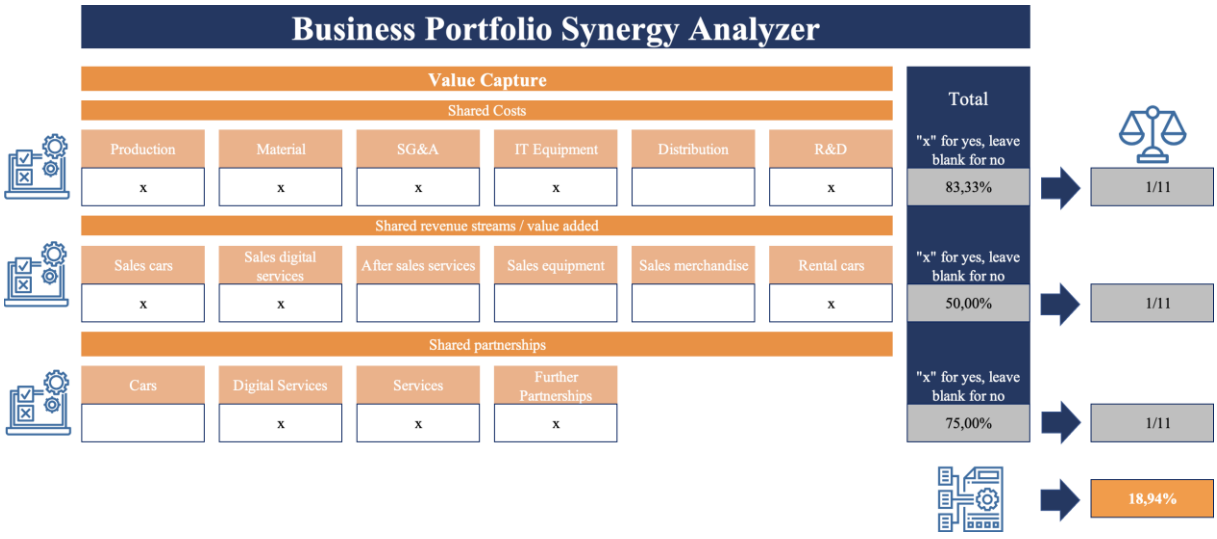


Figure 10: Result value capture

The value creation analysis takes a closer look at the opportunities to exploit synergies in the areas of human capital, network and technology (Figure 11). When looking at human capital, the three interviews revealed an average of 60% that can be taken over from other departments without having to acquire it externally. The expert from the second interview believes that the know-how of such a BM must also be local to the city in which the service is offered. At the same time, not many people are willing to follow every path. She cited the merger of DriveNow and car2go as an example. Only about 30% were willing to move from Stuttgart, about 230

kilometers away, to Munich. In addition, fleet managers have to be hired and possibly software developers, where one faces great competition from tech companies, as they would simply pay more. Besides that, there is also a high rotation rate in such a company, which is why such an average could be justified. All three experts were of the opinion that its integration of eRIDE NOW into the corporate network would be advantageous in order to create data and information links and thus facilitate a transfer of knowledge within the group. The third expert confirmed that this is always done in the BMW Group, but he himself, based on his experience with ReachNow in China, felt that a partial integration would have been better. A full integration into the network would partially slow down processes, as the classic BMW business model is not aligned to new types of projects and the business is too much bound to hierarchical conditions. He suggests designing balance sheet documentation processes separately, as this worked better with a similar project in Seattle, USA, under such conditions than with his fully integrated project in China. The experts state that BMW already has a large part of the technology required for such a BM and that only a few BM specifics need to be purchased or developed.

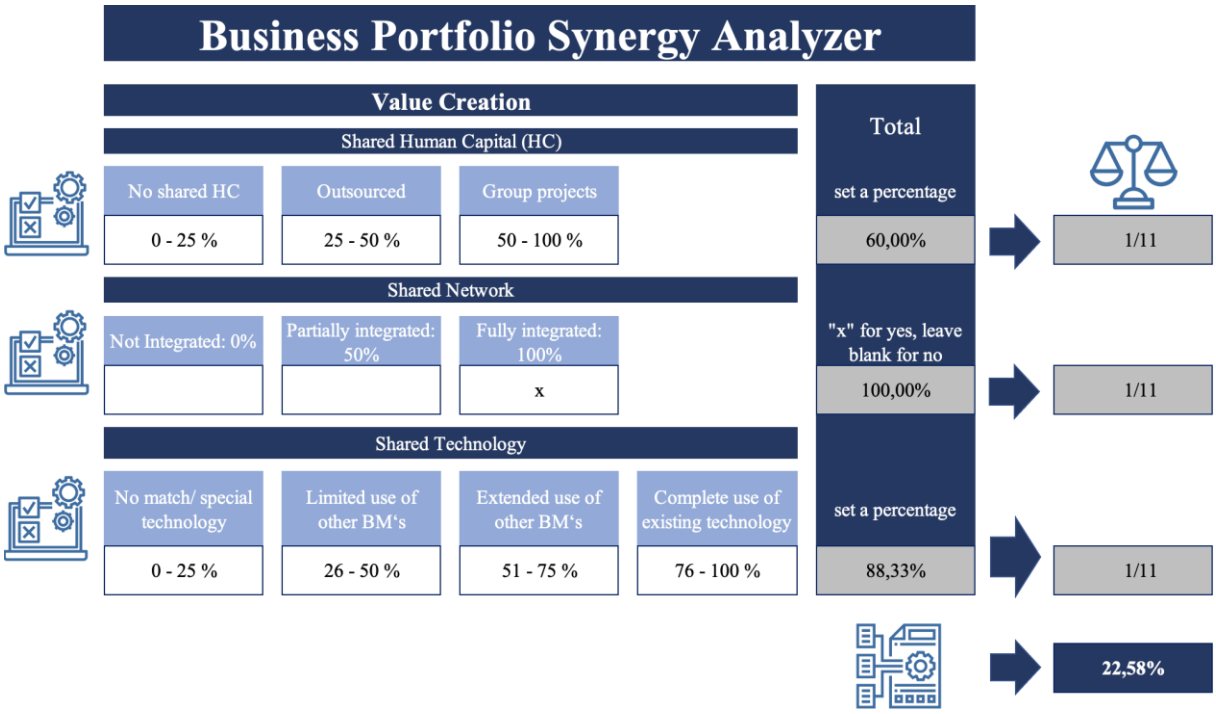


Figure 11: Result value creation

Regarding the value proposition we took a look at the key activities of the group (Figure 12). We analyzed the fleet of the BMW Group as well as the CASE projects. The experts were predominantly of the opinion that eRIDE NOW should be offered with an entire product family, i.e. in this case the new electric vehicles coming to market in 2021 (BMW iX3, i4 and iX). The

BMW Group does have two other fully electric vehicles, the BMW i3 and the MINI Cooper SE, but they are not suitable for ride-hailing service due to their size and their lack of autonomous driving enabling elements. The consensus with all four areas from the second key activity results from the scope. However, the interviewees felt it was important to mention again how important the autonomous driving element is in this example. On the one hand, it is extremely practical to offer autonomous driving in a service like this to take away the customers' fear of autonomous driving and if the drivers are trained accordingly that they can tell the customer a bit about the technology. Autonomous driving could be demonstrated primarily on short routes on the highway (e.g., downtown - airport) or approved routes in the city. On these routes, data can then in turn be collected to make autonomous driving even better and get closer to SAE level five more quickly.

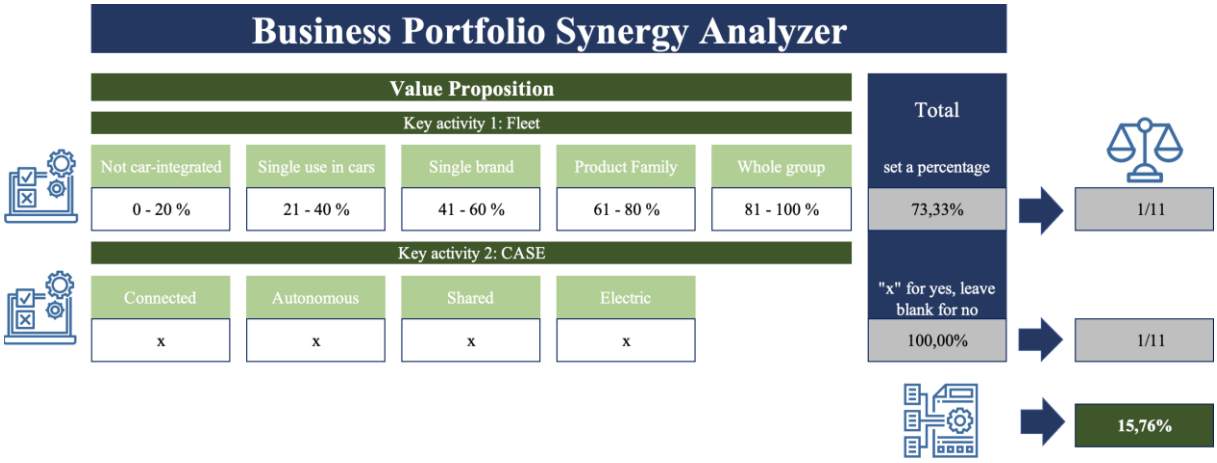


Figure 12: Result value proposition

Last but not least, we analyzed the value delivery section (Figure 13). There were consistent results for the customer criteria of gender and age. All gender groups are of interest for this BM and for the BMW Group's overall business portfolio. In contrast to the overall portfolio, however, only younger age groups come into consideration. The digital natives of generations Y and Z are of particular interest. However, there is a slight deviation in the income groups of potential customers. While two experts were of the opinion that the service should be offered as a premium service in line with the BMW image and thus reserved for the middle to high income groups, the third interviewee saw the BM as also including the lower income groups. In his opinion, people with high incomes though would show no interest in such services. With regard to the type of customer, all agreed on single persons and the in-house offer. At the moment, BMW still operates a shuttle bus service that moves employees between the several BMW campuses in the city and the airport. In order to meet its own sustainability demands

even more, eRIDE NOW would be a good alternative to use the service for such trips as well, in order to get employees from one place to another faster and in a more environmentally friendly way. When it came to sales channels, all the experts were largely in agreement. Sponsoring, trade fairs and other offline events (e.g. street marketing at festivals, university campuses) can be used to reach the masses and promote several products and services at the same time. The same is true for low-cost online alternatives (website, email, social media), which can additionally reach customers much more precisely. However, lobbyism was mentioned as the most important point. Lobbying does not occur as a classic distribution channel, but much more as an enabler. Especially all the licenses for stops, pick-up stations, etc. are extremely important and very difficult to secure. It can be advantageous to already have an iron in the fire through projects in the portfolio that are close to the BM and to exploit these synergies.

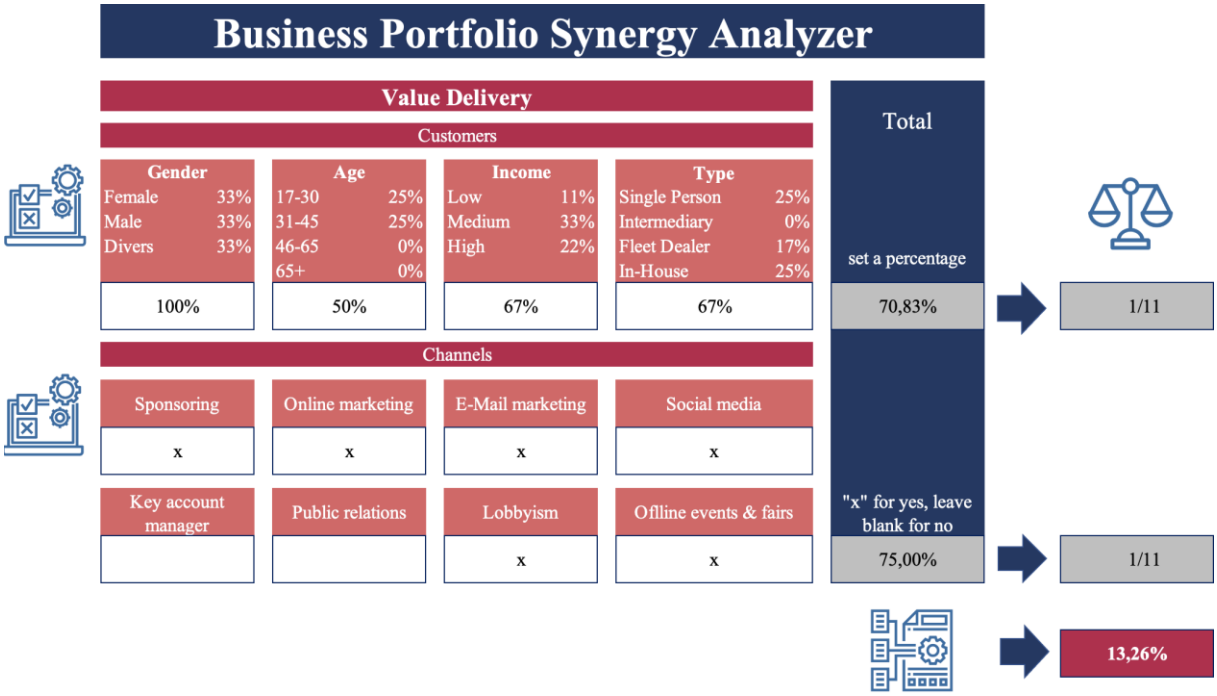
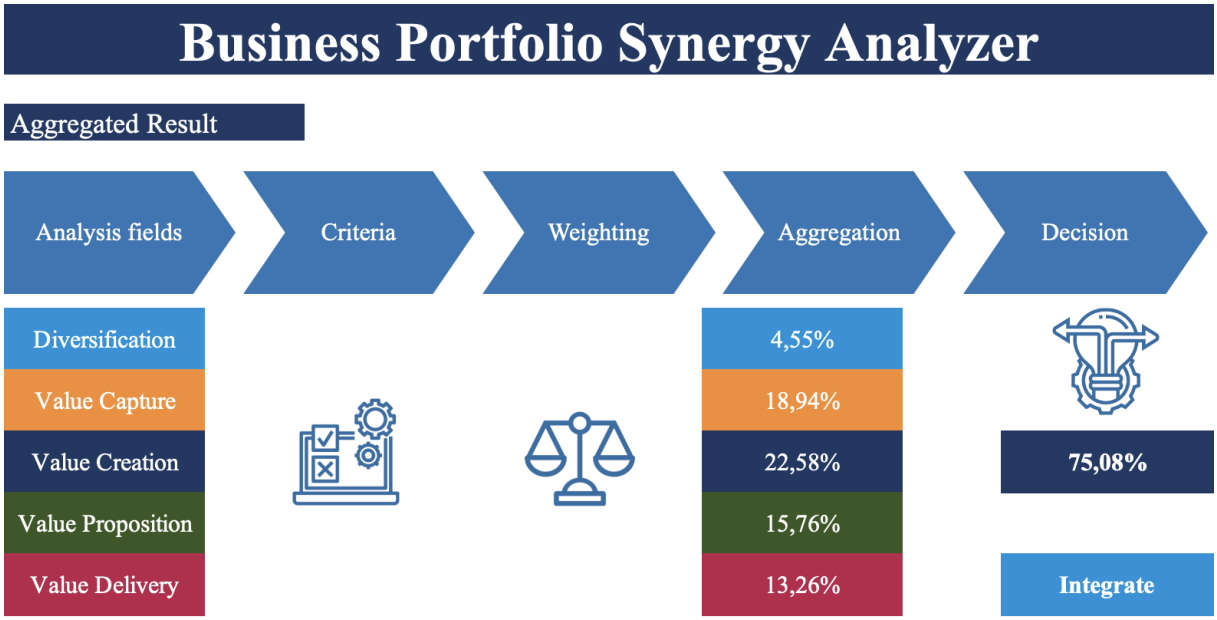


Figure 13: Result value delivery

Since different criteria were more important to the experts, which they would specify with a higher weighting, the weightings for all criteria were kept the same in the aggregated example. Nevertheless, very homogeneous results were obtained, all in the same order of magnitude (70 to 77%). The aggregated average result of the three interviews (Figure 14) is about 75%. However, the strategic consequence indicates the result "integration" in all cases. This means that eRIDE NOW should be included in the product portfolio of the BMW Group, as the synergy potential is correspondingly high in order to add value.

Expert evaluation of the BPSA. The experts stated that the outcome and the model made sense from their point of view and that it was an interesting approach to capture synergy potentials, to structure a new BM in the existing portfolio and it was well generalized for transfer to other industries. Furthermore, the model is easy to understand, to explain, to apply and to manage, because it delivers a clear result. The simplicity of the model can also be used very well to explain the decision to the personnel affected by the resulting decision. On the other hand, the model should be adapted more specifically for each industry. Regarding the missing dimensions, one expert mentioned intangible assets such as image and brand shaping. For inclusion in the example, information, figures, studies, etc. were missing in how far eRIDE NOW could generate synergies with the existing portfolio. In addition, the gut feeling of all interviewees before the interview was more in favor of separation, since at BMW all newer projects are built separately from the main portfolio.



Strategic Consequence		
Fit	Range	Consequence
Good	67 - 100 %	Integrate
Medium	33 - 67 %	Phased Integration/ Separation
Bad	0 - 33 %	Separation

Figure 14: Aggregated result example

5 Discussion & conclusion

This master thesis was intended to find a different approach to mapping and measuring synergies in a BMP and thus to identify possible differences between literature and practice. The academic literature was reviewed to reflect the academic status quo on BM, portfolio, and synergy capture theory. This includes comparisons to current methods in the literature for capturing BMPs, as well as the differences in qualitative and quantitative capture of synergies. On this basis, a new model was developed. Many models in the BM literature only map the current portfolio and do not provide information on potential synergies between individual BMs. Thus, when implementing a new BM, there is no way to show synergies and exploit them effectively. In fact, the literature is limited to specific factors, such as performance indicators to compare the different BMs, rather than considering possible strategic business decisions.

Practical implications. The interviews helped to get more impressions of portfolio management and which different challenges exist in daily life. In addition, the interviews served to test the practical suitability of the model (Business Portfolio Synergy Analyzer). The interviewees unanimously stated that the BPSA was relevant and suitable for practice and a good way to map synergies between a new BM and the existing portfolio. However, limitations were mentioned, such as that it was a suitable tool specifically for the proof-of-concept phase of a new BM, but that in the long run new, future factors (e.g. regulatory changes) would still play into it, which understandably cannot be taken into account at this stage. In addition, more agile methods are currently being used in portfolio management decisions, due to the digital age. Digitalization is forcing companies to continuously review their BMs, making them more dynamic, which is also confirmed in the literature (Wells, 2015). This might imply that the most well-known and frequently used methods in practice and literature to map the portfolio (for example, the BCG Matrix and GE-McKinsey Matrix) will become less important. The literature will adapt to digitalization and the agile portfolio management methods used in practice. Even within the corporation, agile project/portfolio management methods differ from business unit to business unit. In order to prevent complications, the literature will have to focus more on agile portfolio management in the future and develop respective models.

The importance of agility in the automotive industry was explained in this thesis. New BMs, especially in the areas of connectivity, autonomy, shared services and electromobility, are entering the market stronger and faster as a result of technological change, urbanization, climate and demographic change (Kuhnert et al., 2018). In order to keep up with the many new competitors and to keep pace in CASE topics, the literature repeatedly mentions how important

it is for an OEM to create an ecosystem (Bentenrieder et al., 2017; Tian et al., 2016; Walton, 2019; Yin et al., 2017). The result for the classic automotive manufacturer is that it must also grow into a digital company in order to be able to meet customer needs and respond more quickly to further disruptions (Bentenrieder et al., 2017; Kuhnert et al., 2018). BMs will have to become increasingly customer-centric. It also follows that successful digital BMs can best serve customer needs (Bentenrieder et al., 2017). Contrary to the usual mindset in automotive engineering that every part, every process, etc. must be perfect, many trial-and-error projects result in CASE projects. Aligning these mindsets across the different business units is one of the biggest challenges for OEMs. In order to strengthen their competitive position, OEMs will seek for M&A opportunities with CASE technology companies (Elie & Telang, 2020), and focus on R&D in software and services (Kuhnert et al., 2018).

Theoretical implications. However, the BPSA offers a different way to analyze a portfolio and evaluate it for synergies on a quantitative and qualitative basis by also providing a suggested strategic consequence. While many models are presented in a matrix form, the BPSA appears as a five-layer model. This form of illustration allows the portfolio manager to take a detailed look at the various criteria and to provide a qualitative and quantitative assessment of the synergy potential. This type of model allows to make objective evaluations to a large extent. Certainly, a complete detachment from a subjective assessment is not entirely possible, but in contrast to other models from the literature, the portfolio manager can rely mainly on available data without having to make many assumptions. The high level of generality of the model allows easy adaptation to other industries, as criteria can be easily exchanged to fit industry-specific dimensions. For the automotive industry, for example, the key activities in the value proposition dimension were adapted industry-specifically for this specific scenario with “Fleet” as “Key Activity 1” and “CASE” as “Key Activity 2”. Furthermore, the model gives the portfolio manager an overview of the areas in which synergy potentials exist and thus in-house communication channels can be optimally designed for implementation, or relevant partners within the Group can be identified that have similar specific characteristics to the new BM. It also identifies weaknesses in a company's resources and capabilities where partnerships are needed in order to launch the new product. Synergy can occur when existing partnerships are expanded for other novel projects. Once a good relationship exists with external suppliers and third parties, other business units may also be able to benefit by leveraging the same external knowledge and skills.

Limitations and future research potential. One summarizing point that all interviewees mentioned was that before the interview they had a different gut feeling about what ultimately resulted. Since at BMW it seems that predominantly all new CASE projects are built as a separate BM from the portfolio (for example, the joint venture with Daimler: YOUR NOW), their gut feeling told them that there would have to be a separation. Yet, when they saw the eventual outcome of the integration, they were convinced that the outcome was feasible. One explanation for the difference in BMW's actions and the outcome of the BPSA could be that the mindsets of the different work areas (automobile manufacturing vs. CASE projects) differ too much, so that productive collaboration does not seem possible. The BPSA could be expanded in further research to include other such soft factors. However, the BPSA is also somewhat limited in its overall presentation of a portfolio and the classification of the portfolio as to whether it sufficiently meets customer needs. Thus, it does not allow for an evaluation of the portfolio's positioning in the market. For this the classical models from the literature are better suited. The model mainly aims at facilitating the decision-making process for integration or separation. Further limitations of this work are the number of interviews that were conducted as part of this work. Moreover, only experts from the automotive industry, or more precisely employees of the BMW Group, were interviewed. Since other industries were not the subject of this research, the results of this thesis are biased towards feasibility in the automotive industry. Nevertheless, the questions in the interviews were formulated as openly and as generic as possible in order to be able to ensure greater generality. It is likely that the structure of the BPSA is not entirely complete, as the company still has further internal information, with which individual criteria could still be adjusted. In addition, the BMW Group is a large international corporation, so no medium-sized or smaller companies were subject to this study. It would therefore be advisable to extend the study with regard to the size of a company and other industries in order to ensure greater generality of the model.

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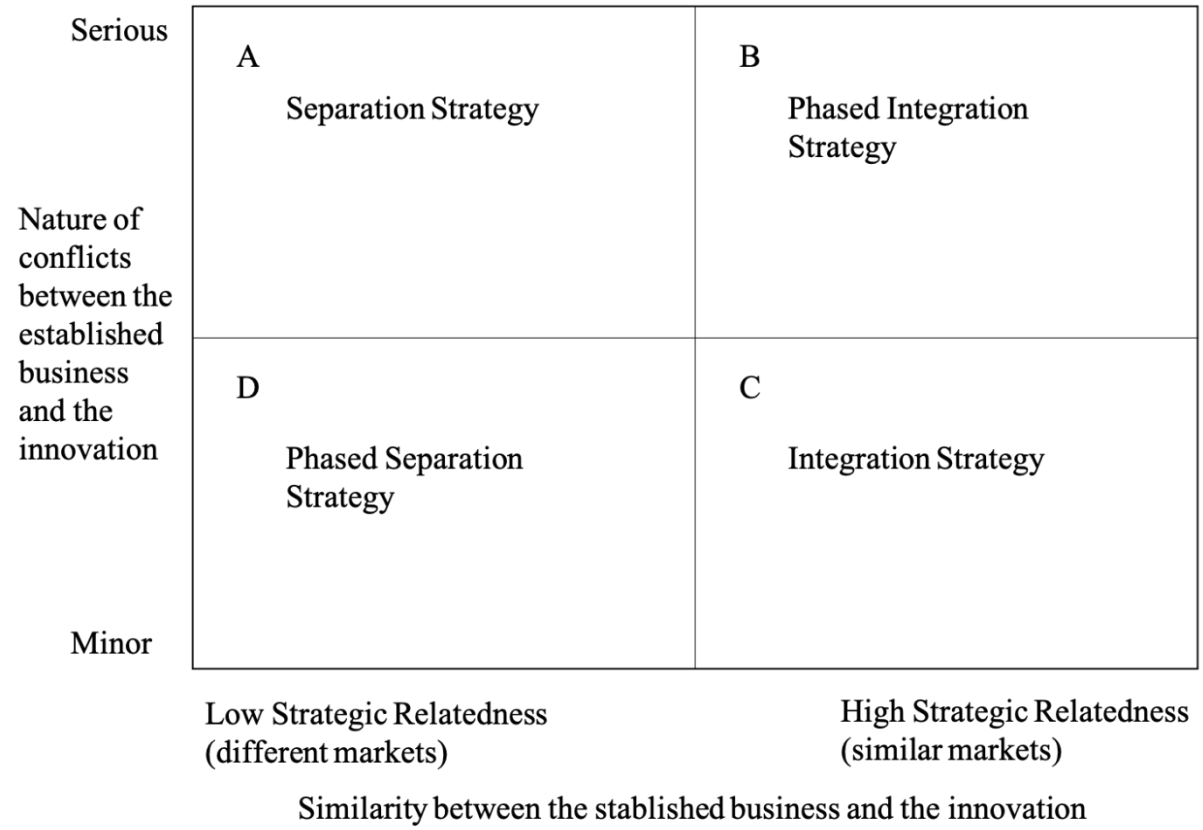
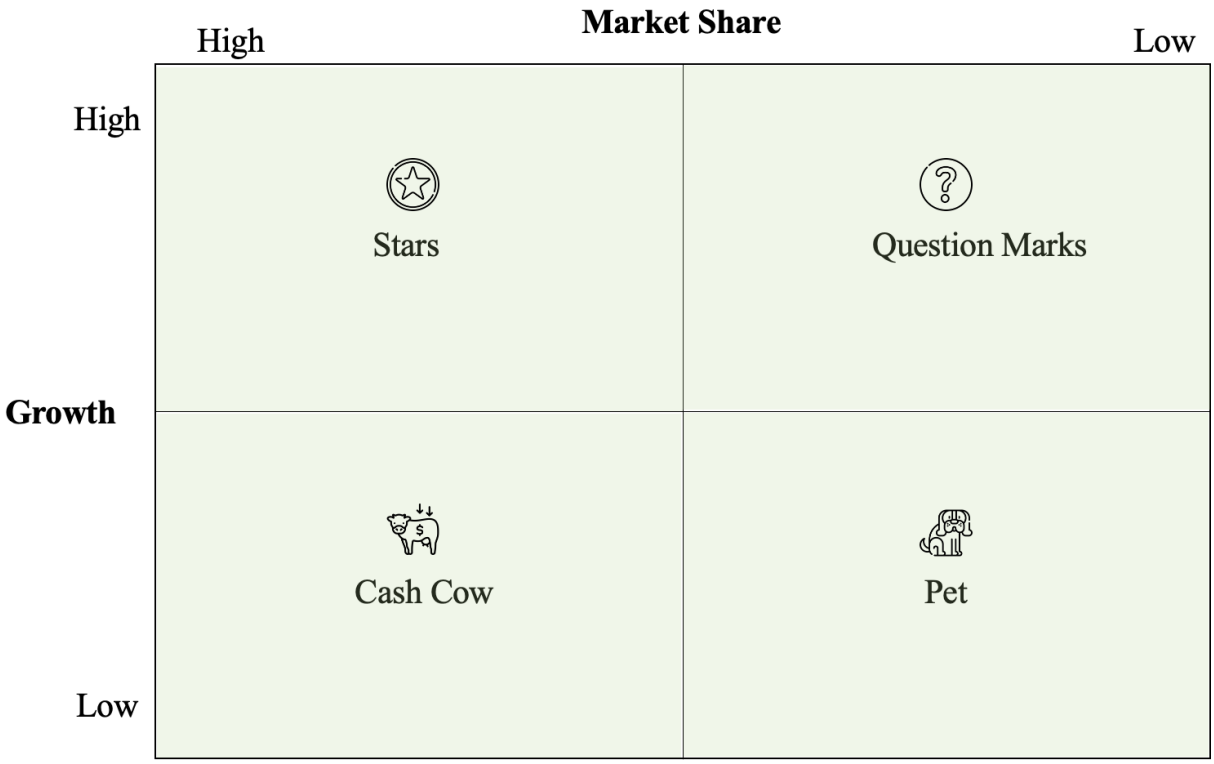
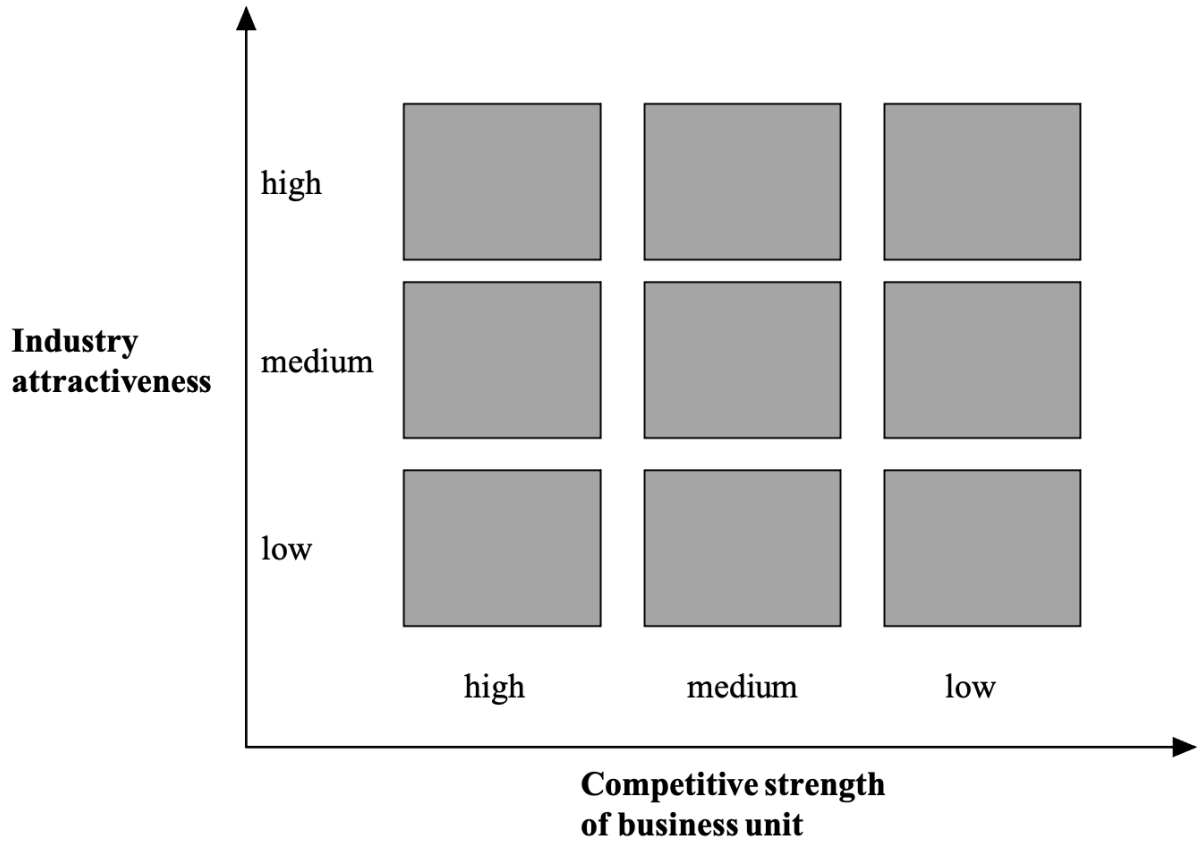
Appendix A: Portfolio management models



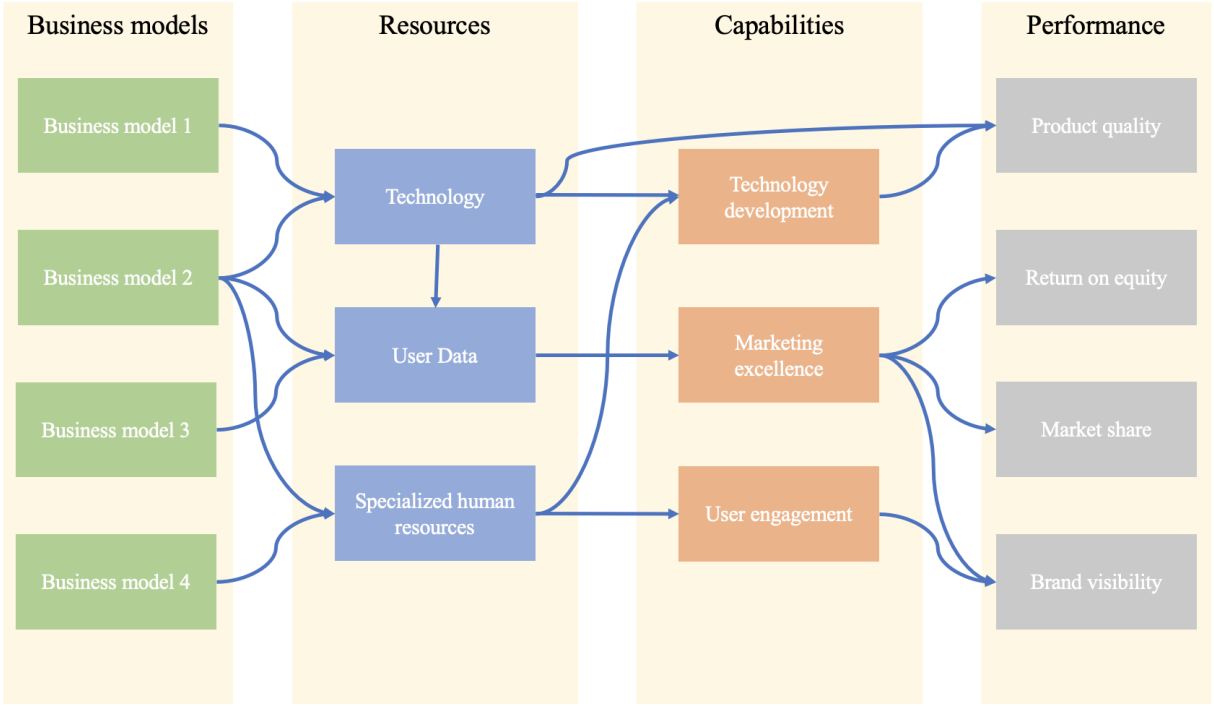
Appendix Figure A1: Strategies for dual business model management (Markides & Charitou, 2004)



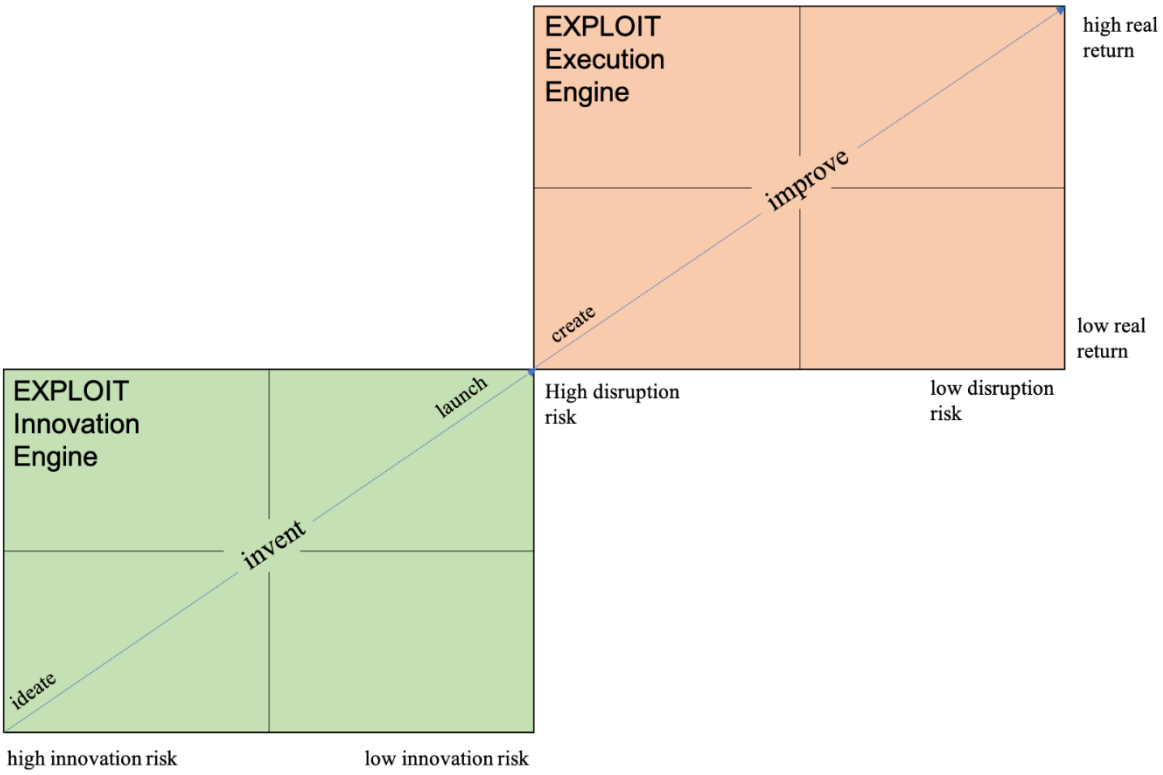
Appendix Figure A2: BCG Growth Share Matrix (Reeves et al., 2014)



Appendix Figure A3: GE-McKinsey Matrix (McKinsey & Company, 2008)

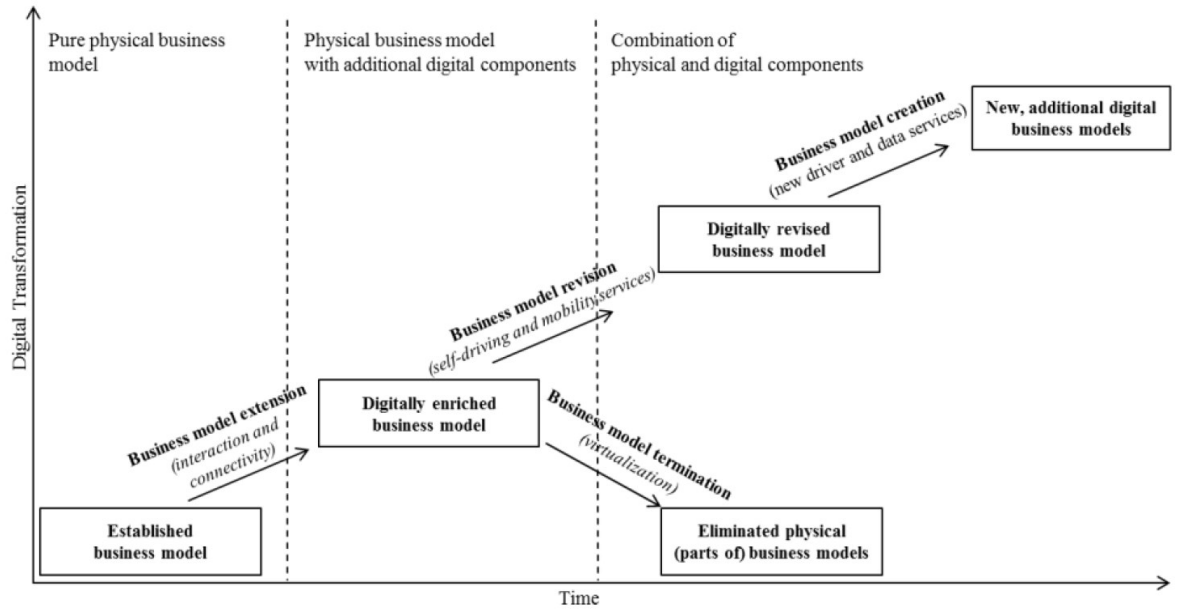


Appendix Figure A4: Business Portfolio Analyzer (Aversa et al., 2017)



Appendix Figure A5: Business Portfolio Map (Osterwalder & Pigneur, 2017)

Appendix B: Impact of digital transformation on business models



Appendix Figure B6: Impact of digital transformation on business models in the automotive industry (Hanelt et al., 2015)

Appendix C: Interviews summary

Question	Interviewee 1	Interviewee 2	Interviewee 3
To what extent do you work together with other business units of the BMW Group in your profession and what are the potential conflicts and possibilities for improvement there?	*Work with other business units:* a lot *Conflicts*: autonomous driving and mobility services are atypical for old big players in the automotive industry; software vs. hardware: unfinished products possible with software products, unthinkable in car manufacturing; different mindset within the Group *Improvements*: not answered	*Work with other business units:* a lot *Conflicts*: Research Predevelopment vs Research Series Development; Car Manufacturing vs Digital Services; Managers vs Revenues *Improvements*: not answered	*Work with other business units:* medium amount *Conflicts*: Quality, maturity, scalability vs. resource management in selling cars to people; autonomous driving vs. mobility service: mobility service more cost-effective because you have to worry about fewer priorities *Improvements*: not answered
To what extent are you involved in portfolio management decisions?	A lot	Mainly touching points with KAM	Few involvement
What tools do you currently use for portfolio management?	Agile product/ software development, sprints (2-week cycle, set development goals, test constantly), scrum master (plan, observe, improve sprints).	Scrum master	agile product/ software development
To simplify the geographical diversification, we consider the introduction of the example in the first 2 years. How would you place the example on the market from a geographical perspective?	Local & National: but difficult at the moment in Germany. Ride-hailing market is not in Germany, rather USA, China, Canada and Mexico	Local & National: Berlin, Munich & for the future after proof-of-concept phase: Continental: take legislation into account, but if then first major cities Global: Core markets shifting towards USA & Asia	Local & National: Regulation is a huge issue, national expansion of the business model the maximum

In which areas do you think costs can be shared with other business units?	Production, Material, SG&A, IT Equipment, R&D	Production, Material, SG&A, IT Equipment, R&D	Production, Material, IT Equipment, R&D
In which areas do you think sales can be generated with other business units, or in which areas will the value be increased by introducing the example?	Sales Cars, Rental Cars, Sales Digital Services	Sales Cars, Rental Cars, Sales Digital Services	Sales Cars, Rental Cars, Sales Digital Services
In which areas of existing partnerships do you think the value of these can be increased by introducing the example?	Digital Services, Services, Further partnerships: especially drivers and insurances	Digital Services, Services, Further partnerships: insurances & fleet manager	Digital Services, Services, Further partnerships: fleet manager & driver
To what extent do you think staff can be transferred from other areas or existing shared service centers can be used?	50%	80%	50%
To what extent do you think the example can be integrated into the existing corporate network?	Fully integrated	Fully integrated	Partially integrated
To what extent can the existing technology in the company be used?	85%	85%	95%
To what extent can the example be integrated into the existing fleet?	70%	70%	80%
To which area(s) would you classify the example in the case of CASE driving?	All of them	All of them	All of them
Please give an assessment of which target groups this example could apply to, which BMW already serves with its existing products.	All genders; 17-45 years old; medium-high income; Type: Single Person, Fleet Dealer, in-house	All genders; 17-45 years old; medium-high income; Type: Single Person, Fleet Dealer, in-house	All genders; 17-45 years old; low-medium income; Type: Single Person, in-house
Which distribution channels do you think can be used for this example that BMW	Sponsoring, Online Marketing, E-Mail Marketing, Social Media, Lobbyism,	Sponsoring, Online Marketing, E-Mail Marketing, Social Media, Lobbyism,	Sponsoring, Online Marketing E-Mail Marketing, Social Media,

also uses for other existing products?	Offline Events & Fairs	Offline Events & Fairs	Public Relations, Lobbyism, Offline Events & Fairs
I have assigned the following weightings to the criteria. Would you agree with them or what would you change?	Give 3 extra points to Channels, Human Capital and Costs	Give 3 extra points to Customers, Technology & Costs	All of the same importance
Now we get a result of % that would result in an XXX. Do you think that this model would help you as a portfolio manager to exploit synergies in your portfolio more optimally? If so, where do you think the strengths are. Where do you think the weaknesses are?	In principle, an interesting approach to structuring a portfolio, maybe too general	A ride-hailing project already existed once in China; integrative approach, general focus is good so that it is well transferable to other industries; slight adjustments also possible to make it more industry-specific	Easy to use, to understand, to explain, suitable for management, clear statement as end result; gut feeling was different, maybe too simple
Do you have any other comments/improvement suggestions for the model? For example, is a dimension missing or do you find one superfluous	A bit contrary to what BMW usually does with similar BMs (often separated, as the mindset often cannot be reconciled with the classic automaker approach); possibly increase range for phased integration/separation	Image, brand shaping	Future strategic options
Would the model be helpful to you, or relevant in practice?	Model understandable, especially for the proof-of-concept phase a good approach	Yes	yes, especially the decisions are easy to explain to the staff using this model why to integrate / separate

Appendix Table C1: Interviews summary