Master Thesis

Validation and Adaptation of a Stage Gate Process for Business Model Innovation at AVL List GmbH

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Abstract

In times in which the imitation of individual products, processes and services is becoming increasingly easy, the establishment and thus the innovation of holistic business models is of great economic importance.

Hence, the master thesis 'Validation and Adaptation of a stage gate Process for Business Model Innovation at AVL List Gmbh' by Maximilian Ferstl deals with the advancement and optimization of an already existing process for business model innovation at AVL. At the beginning of this master thesis, however, this existing process is only a first draft and is not yet implemented at AVL. Therefore, the question arises as to how an optimal process must be designed to support its user appropriately in business model innovation. To discuss this question, interviews with AVL internal experts in the field of business model innovation were conducted. Based on the obtained insights, the design of the stage gate process was completed. The result is a finished stage gate process, which AVL´s employees can utilize to conduct successful business model innovation.

This master thesis contributes to the identification of the most relevant aspects for business model innovation in industrial environments. Additionally, this thesis provides an approach on how to conduct business model innovation in a structured way.

Kurzfassung

In Zeiten, in denen die Nachahmung einzelner Produkte, Prozesse und Dienstleistungen immer einfacher wird, ist die Etablierung und damit die Innovation von ganzheitlichen Geschäftsmodellen von großer wirtschaftlicher Bedeutung.

Die Masterarbeit „Validation and Adaptation of a stage gate Process for Business Model Innovation at AVL List Gmbh“ von Maximilian Ferstl beschäftigt sich daher mit der Weiterentwicklung und Optimierung eines bereits bestehenden Prozesses zur Geschäftsmodellinnovation bei AVL. Zu Beginn dieser Masterarbeit stellt dieser bestehende Prozess jedoch nur einen ersten Entwurf dar und ist bei AVL noch nicht einsatzbereit. Es stellt sich daher die Frage, wie ein optimaler Prozess gestaltet sein muss, um seine Anwender bei der Geschäftsmodellinnovation angemessen zu unterstützen. Um diese Frage zu erörtern, wurden Interviews mit AVL-internen Experten im Bereich der Geschäftsmodellinnovation durchgeführt. Basierend auf den gewonnenen Erkenntnissen wurde das Design des Stage-Gate-Prozesses vervollständigt und optimiert. Das Ergebnis ist ein fertiger Stage-Gate-Prozess, der nun benutzt und ausgeführt werden kann, um Geschäftsmodellinnovationen in der AVL zu verwirklichen.

Diese Masterarbeit leistet einen Beitrag zur Identifikation der relevantesten Aspekte für Geschäftsmodellinnovationen im industriellen Umfeld. Zusätzlich liefert diese Arbeit einen Ansatz, wie Geschäftsmodellinnovationen strukturiert durchgeführt werden können.

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List of Abbreviations

AVL..... Anstalt für Verbrennungskraftmaschinen List

BMI .....Business Model Innovation

B2B ..... Business to Business

B2C .....Business to Consumer

KPI ..... Key Performance Indicator

MVP .....Minimum Viable Product

PESTEL..... Political, Economic, Social, Technological, Environmental and Legal Analysis

ROI .....Return of Investment

SWOT .....Strengths, Weaknesses, Opportunities and Threats Analysis

VP..... Vice President

1 Introduction

A business model is the representation of a firm´s underlying core logic (Shafer, Smith, & Linder, 2005, p. 202) and a good business model is essential to every successful organization (Magretta, 2002, p. 4). To establish successful business models, companies engage in business model innovation (BMI). Business model innovations are seen as the basis of new competitive advantages, as they contribute to more sales, higher profit margins and greater cash flows (Verma & Bashir, 2017, p. 8).

Given this background, this master thesis at hand is dedicated to elaborating a systematic approach to conduct business model innovation at the company of AVL List GmbH. In section 1.1 the research question will be concretized and subsequently in 1.2 the structure of this thesis will be outlined.

1.1 Research Question

In a world that is becoming faster, more interconnected, more digital, more global, and altogether more complex, companies are striving for consistent structures in what they do to cope in today's business environments. In this digitized world, data-driven business models have emerged that take advantage of the thousands of exabytes of data being produced all over the world (Hartmann et al., 2016, p. 2). Within this world, the company of AVL searches for structured processes to conduct business model innovation in order to gain and maintain a competitive advantage in the marketplace.

Although there are already some concepts and methods for structured business model innovation in literature (Schallmo, 2013, S. 108 ff), these cannot be used effectively in the company immediately. This follows from the fact that these processes are too superficial and do not consider company-internal specifics. A useful process considers methodologies, that are already established in the company, parallel processes as well as the company's own approach to topics, such as innovation or decision-making (Improving Business Processes: Expert Solutions to Everyday challenges, 2010, pp. 23-24). All these circumstances prompted AVL to design a structured process that supports and guides business model innovation. Since processes with stage gate characteristics can improve and accelerate innovation, AVL has selected this kind of process for business model innovation (Di Biase, 2015, p. 212). However, the design of this stage gate process is not yet complete. Moreover, it needs refinement in various ends. For example, the activities to be carried out in the process and their sequence have not yet been determined. Furthermore, the gate criteria are incomplete. Nevertheless, AVL's goal is to mature the stage-gate process and then implement it in the company. Thus, the stage-gate process can be used for business model innovation.

Based on these premises, the research question of this master thesis is:

How shall a stage-gate process for business model innovation be designed in order to be implemented successfully at AVL?

In the course of this master thesis, it will be discussed how BMI can be conducted using a stage gate process and how this process shall be designed. Scientifically, it is the aim of this thesis to investigate the theoretical background of business model innovation and to establish a linkage between theory and the actual execution at AVL. Practically, it is the thesis 'goal to complete the design of the stage gate process to make it ready for usage at AVL. Therefore, a series of interviews will be conducted with AVL employees to discuss the design of the stage-gate process and the activities included in it.

1.2 Structure of the Master Thesis

This section deals with the formal structure of this thesis. It describes how the given research question is attempted to be answered and which chapters this master thesis consists of.

The master thesis at hand is divided into ten chapters. In chapter 2 the theoretical background of the thesis is introduced. Therein, the concept of a business model and the elements of which it is composed are described. Furthermore, business model innovation is discussed and common methods for business model innovation are explained. Finally, the methodology of the stage-gate structure is presented and the connection to business model innovation is shown.

The chapters 3-10 are arranged according to the instructions given by Ahrens (2012). He outlines a structure that can be applied to scientific theses whose goal is to modify known scientific methods and to test their functionality (Ahrens, 2012, p. 6). The adaptation of the Stage Gate Process, which is the subject of this master thesis, corresponds to the afore-mentioned field of application. Ahrens (2012, p. 8 ff) emphasizes the problem-solving cycle by Haberfellner et al. (2019) as a central element for the proceedings of a master thesis. This problem-solving cycle is applied within this master thesis to answer the given research question. The problem-solving cycle, which Ahrens slightly modified to fit the purpose of scientific theses, is shown by Figure 1.

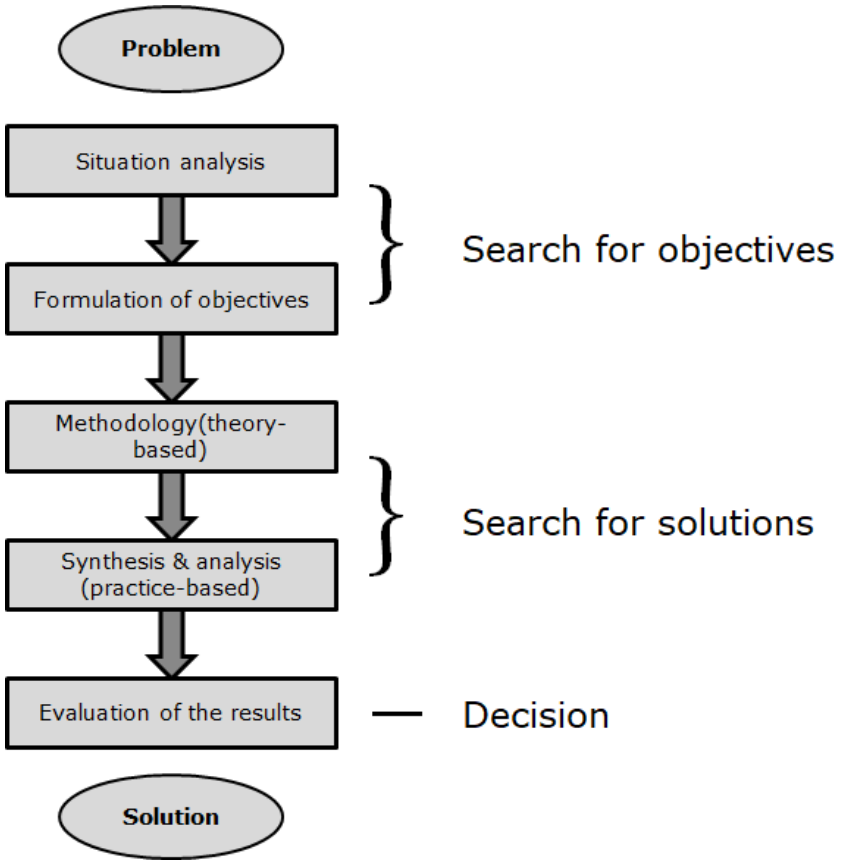


Figure 1 The problem-solving cycle (modified from (Haberfellner, de Weck, Fricke, & Vössner, 2019, p. 127))

These steps of Figure 1 are now described in the following and it is explained how each step is applied to the underlying master thesis.

Situation Analysis

According to Haberfellner et al. (2019, p. 169), the first step after perceiving a problem is to sufficiently familiarize with the current situation. The problem at hand and its scope need to be identified in full depth. For this master thesis this means to familiarize with the current state of the stage gate process designed by AVL. The preliminary work already done by AVL is closely examined. In this respect the yet loose documents about the stage gate process are concentrated and studied. Based on this analysis, one can deduce in which parts of the process adaptations and additions are needed. Chapter 3 is dedicated to this situation analysis.

Formulation of Objectives

Ahrens (2012, p. 9) highlights the importance to formulate the goal as concretely as possible. Furthermore, the main goal should be differentiated into sub-goals. For this master thesis the main goal

is to get the process ready for use at AVL. For this rough goal a ‘definition of done’ is to be elaborated. This states under what circumstances the process is ready to use at AVL. Chapter 4 is dedicated to that.

Methodology (theory-based) & Synthesis and Analysis (practice based)

If the current situation and objective (equivalent: research question, thesis) are known, methods can be selected, that are suitable for achieving the goal (Ahrens, 2012, p. 10). Accordingly, it is discussed how in theory the methods and taken steps contribute to the overall goal. Subsequently these are put into practice.

For this thesis, three major steps are taken. The following will give a short summary about the intended steps.

- **Conducting interviews**

According to Ahrens (2012, p. 10), an interview series is a valid and suitable means to generate original data on the object of investigation. In this regard, an interview series about BMI is conducted at AVL. The evaluation of this interview series will provide suggestions on how the process should be designed to support business model innovation most effectively. Further, best practices and lessons learned in the context of business model innovation are gathered and the findings are then integrated into the process. The interview series is described in Chapter 1.

- **Adaptation of the stage gate process**

Chapter 6 deals with the adaptation of the stage gate process. Therefore, 13 design requirements for the adaptation of the stage gate process are formulated based on the results of the interview series. Subsequently, these design requirements are integrated into the stage gate process thus adapting the process to AVL´s needs.

- **Contribution to a playbook**

Documents which support the application of the stage gate process are to be created within this step. These documents are comprised in an operating manual called ‘playbook’. The findings from this master thesis will contribute to the creation of this playbook. Accordingly, various documents and depictions are created that ultimately define the stage gate process and support its application. These documents, for example, comprise illustrations of sequence diagrams, recommendations for action, or information flow diagrams.

Evaluation of results

According to Ahrens (2012, p. 10), the results of the practical work need to be evaluated in the next step. Hence, it is examined whether the stage gate process is ready for use at AVL and whether all set objectives have been achieved. Chapter 8 is dedicated to this evaluation.

Summary of the master thesis

Finally, the entire master thesis is summarized in Chapter 9. This allows the reader to get a quick overview of the master thesis without having to read through it in its entirety.

Outlook

According to Ahrens (2012, p. 11) the master thesis is finalized by providing an outlook into the future. Therefore, chapter 10 deals with the future situation concerning the stage gate process for business model innovation at AVL.

2 Theoretical Background

2.1 Business Models

The late 1990s brought an enormous boom of the internet that went hand in hand with growing numbers of internet businesses. These increasing numbers of internet businesses also led to a plurality of fashions in which businesses were conducted. They were referred to as 'business models' – so it was in this time that this term was coined. (Magretta, 2002, p. 3)

Ever since the term business model first arose, there are numerous definitions to it. In this regard Wirtz (2016, p. 67) states: *'A business model is a simplified and aggregated representation of the relevant activities of a company. It describes how marketable information, products, and / or services are generated by means of a company's value-added component. In addition to the architecture of value creation, strategic as well as customer and market components are considered in order to realize the overreaching objective of generating and securing a competitive advantage.'* A further definition is given by Chesbrough (2006, p. 2): '*A business model creates value by defining a series of activities from raw materials through to the final consumer that will yield a new product or service with value being added throughout the various activities. The business model captures value by establishing a unique resource, asset, or position within that series of activities, where the firm enjoys a competitive advantage.'*

In contrast to these broad definitions, the I.R. Management Association (2020, p. 598) provides a very concise but memorable explanation of a business model: *'All it really means is how you plan to make money.'*

The following paragraphs will clarify what exactly a business model is and what elements it comprises. This is done based on Gassmann's definition of a business model. This definition by Gassmann was chosen among the many possible ones because it is consistent with most literature sources used for this master thesis. According to Gassmann et al. (2013, p. 6), a business model consists out of four elements:

- The customer
- Value proposition
- Architecture of the value chain
- Revenue model

These elements are related and interact with each other. Further, each element holds a specific question that a business model answers. Figure 2 illustrates the business model's elements and their corresponding questions.

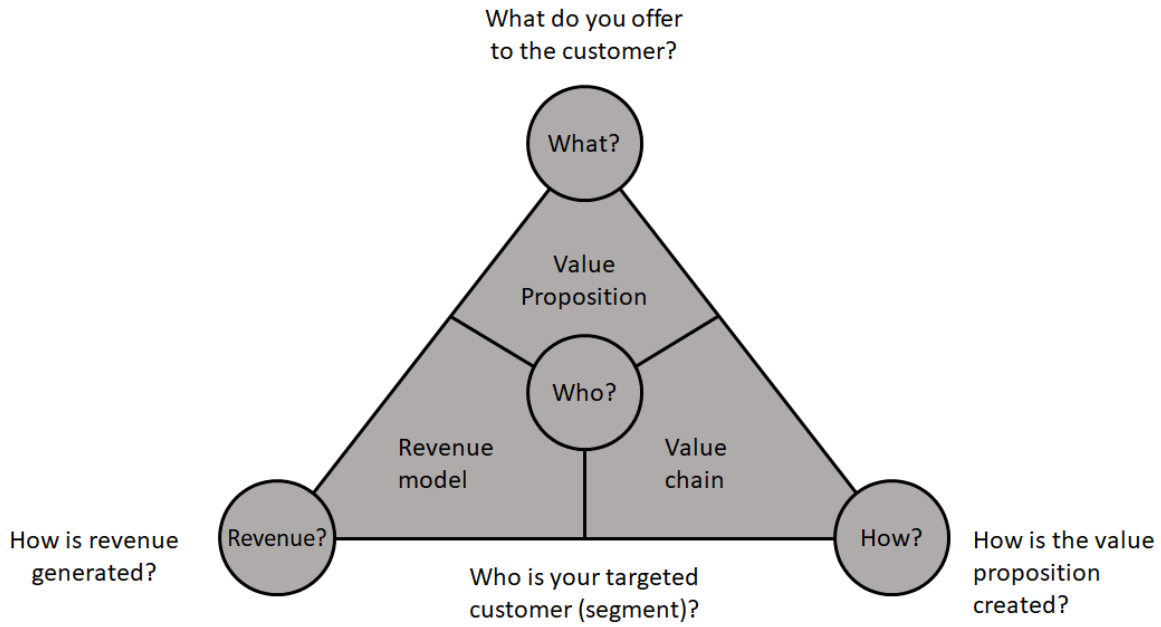


Figure 2: A Business model and its elements (modified from Gassmann et al. 2013, p.6))

In summary, a business model defines who your customer is, what you sell, how your offering is created and how revenue is generated (Gassmann et al. 2013, p. 7). The following describes the elements of a business model.

2.1.1 The Customer

The customer is an individual, group or organization who receive an offering that satisfies them in exchange for money or other valuable considerations. They are at the center of every business model (see Figure 2), because - broken down - organizations only exist to engage with its customers. Furthermore, the purpose of every profit-oriented organization is to attract customers, to satisfy them and therefore to retain them as customers. This generates revenue and enables the organization to survive and grow. (Doole et al. 2005, p. 4)

Since the customer plays the central role within the business model it is essential to examine them in detail. It is therefore important to identify and clarify who precisely your customer is and what exactly satisfies them. In this regard a customer profile provides relevant information. A customer profile investigates the targeted customers and their characteristics. It examines the customer needs and the situations in which a potential offering might be useful. In the context of B2B marketing the customer profile describes in which industry segment the customer operates. Further it describes the size of the customer organization, their range of offerings and their existing supplier or competitor relationships (Wright, 2004, p. 197). Moreover, a detailed profile describes the customers purchasing behavior and

their preferences. In short it comprises everything you must know about your future customer. (Nielsen et al. 2015, pp. 81-92)

In terms of business models Osterwalder et al. (2015, p. 9 ff) describe three dimensions that represent a customer profile:

- Customer jobs
- Customer pains
- Customer gains

Customer Jobs

The customer jobs describe the situations in which a potential offering might prove helpful to the customer. They describe the tasks the customer wants to perform or the problem they are trying to solve. Furthermore, a customer job can also be of supporting character that helps the customer reach a higher goal. (Osterwalder et al. 2015, pp. 12-13) In this respect, the customer job in B2B contexts represents a contribution to the value chain of the receiving company (Russo & Confente, 2017, p. 2).

Customer Pains

The Customer pains are the negative emotions a customer has while carrying out the customer jobs. The human nature always strives to avoid any sort of pain. Therefore, it is important to know these pains in order to avoid them. Organizations which hold the information about these pains, and which are able to solve them have a valuable competitive advantage (Martins, 2015, p. 43). The roots of these pains can be of different nature. The customer job either cannot be done at all or can only be done inadequately. Safety risks as well as bad emotions like frustration, fear or annoyances can lead to customer pains. In addition to that an offering´s price or its inconveniences in use are also potential pains. (Osterwalder et al. 2015, pp. 14-15)

Customer Gains

The customer gains are the benefits that the customer is taking advantage of after the purchase of an offering. It is too short sighted to believe that the gains are the simple opposite and remedies of the detected pains. This is because the gains can address unspoken, implicit ambitions or requirements that

are subconsciously taken for granted by the customer. Moreover, a gain can also be a feature of great value the customer has never asked for in the first place. (Osterwalder et al. 2015, pp. 16-17)

2.1.2 Value Proposition

The value proposition describes **what** is offered to the customer to satisfy their needs. (Osterwalder et al. 2015, p. 6). Further, the Value proposition is some combination of products, services, information, or experiences offered to a market to satisfy a need or wants (cf. Kotler & Armstrong, 2018, p. 9). These market offerings enable the customer to fulfil the customer job. In most cases products are not sold on its own but services like for example customer consultation, product reviews or operation manuals are attached to it. However, *'it is crucial to acknowledge that this bundle of products and services doesn´t create value alone – only in relationship to a specific customer segment and their jobs, pains and gains.'* (Kotler & Armstrong, 2018, p. 671). Offerings exist in various shapes and forms. In this regard Osterwalder et al. (2015, p. 29) provide a classification of offerings.

- Physical/tangible: manufactured goods
- Intangible: copyrights, information, assistance
- Digital: programs, music, blogs etc.
- Financial: insurances loans bonds etc.

2.1.3 Architecture of the Value Chain

Porter (2014, p. 61) states in his definition of value chain: *'Every firm is a collection of activities that are performed to design, produce, market deliver, and support its product. All these activities can be represented using a value chain.'* Along this value chain, the value proposition for the customer is created. The term architecture refers to how all these value activities are strategically aligned and interact with each other. It is notable that since value chains deal with offerings, the appropriate level for constructing a value chain is the business unit and not a firm´s corporate level. In order to understand the concept of value chain and its architecture, the components of the value chain need to be explained.

As one can see in Figure 3 below, the value chain consists of two major sections, the primary activities and the support activities. The former ones are defined as processes which add value to the offering, and which are essential for its physical production. On the other hand, the latter ones contribute indirectly to the production by taking care of organizational issues, thus supporting the primary activities. (Porter, 2014, p. 61 ff)

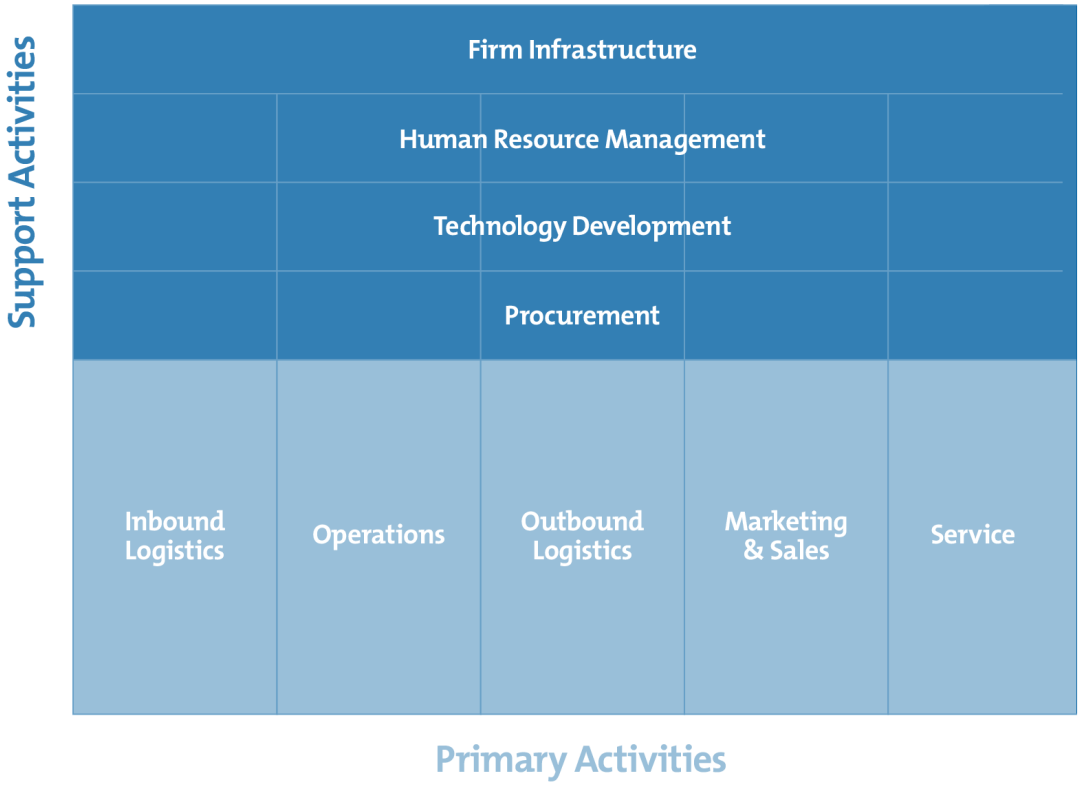


Figure 3 Value chain, (modified from (Porter, 2014, p. 64))

2.1.3.1 Value Chain: Primary Activities

Primary activities comprise the activities of the physical creation of the product, the transfer and sale to the customer as well as the after-sale assistance. More specifically, primary activities can be classified into 5 generic categories. These categories can be identified in any given company. Namely the categories are: Inbound logistics, operations, outbound logistics, marketing & sales, and service. They are described in Table 1 below. (Porter, 2014, pp. 68-70)

Activity	Description
Inbound logistics	All activities that deal with receiving, warehousing and domestic handling of goods that are used as inputs to the offering (Porter 2014, p68) Furthermore, inputs to offerings of data-driven business models can be data sources. (Hartmann, Zaki, Feldmann, & Neely, 2016, p. 2)
Operations	All activities that deal with the transformation of inputs into the final product: processing machining, assembly, packaging etc.
Outbound logistics	All activities that deal with the distribution of the finished products to resellers or customers such as finished goods warehousing, delivery vehicle operations but also order processing and scheduling.
Marketing & sales	All efforts that are taken to bring the product closer to the customer to ultimately sell it and all activities it takes to transact the purchase: advertising, promoting, pricing, sales force etc.
Service	All activities that maintain, increase, or renew the bought value such as reparations, updates part supply etc.

Table 1 Primary activities of a value chain (derived from (Porter, 2014, pp. 68-70))

2.1.3.2 Value Chain: Support Activities

As their name indicates, support activities do not end in themselves, but they support primary activities. Their main goal is to increase both efficiency and effectiveness of primary activities. Porter (2014, p. 64) divides support activities into four main categories: Procurement, technology development, human resource management and the firm´s infrastructure.

Procurement

Procurement is the activity of purchasing inputs for the value chain. These inputs comprise consumable goods like raw materials and relief supplies as well as non-consumable goods like assets, tools, and equipment. However, procurement can also cover the provision of capital, which it takes for ongoing operations. Although inputs are often linked with primary activities, the act of purchasing them clearly belongs to support activities. This is because procurement is a lot more about the strategy of where and when to buy inputs than about the inputs itself. Furthermore, the perpetuation of effective supplier

relations, cost minimization and quality maximization as well as the search for alternative inputs and assets are subject to corporate procurement. (Baily, Farmer, Crocker, Jessop, & Jones, 2015, S. 3 ff)

Technology Development

Every block along the value chain uses technology. This ranges from printing devices in the accounting to the many different forms of technology used in the production itself. Porter rather uses the term technology development than R&D because R&D is commonly thought to be only dedicated to product development. However, every kind of technology development - be it process development, the development of management or communication systems - can support primary activities to become more efficient. (Porter, 2014, p. 70)

Human Resource

The human resource management is responsible for providing the right work forces at the right time, at the right quantity in the right location. The work forces then execute the strategic decisions of the management. (Berger, Berger-Klein, Krüger, & Linhart, 2004, p. 102) Thus, the human resource management supports the value chain by providing adequately educated work forces for both primary and support activities.

Firm Infrastructure

This term refers to fundamental facilities and services that enable the function of a working system. Infrastructure can be of competitive advantage if the facilities − for example an implemented information system − help employees work more efficient. (O´Sullivan & Sheffrin, 2007, p. 474)

Architecture of the Value Chain and its Elements Interaction

Companies run by utilizing a value chain with its described primary- and support activities. These activities can be found in every value chain. However, it is a question of the value chain´s architecture to decide on which of the activities to focus on. For example, if a company´s offered value is scientific research, it will focus on hiring the best qualified scientists. Whereas, a warehousing company will focus on effective means of in – and outbound logistics. The architecture shaping process also raises the question of which activities are carried out in-house and which parts and services should be purchased - that is, outsourced. A further question is, at which position of a supply chain shall a product and service operate and what scope of the supply chain shall it cover. To give an example, a company in the automotive industry must decide if it wants to accompany the car from its unprocessed raw materials to its final sale or if it only wants to contribute the powertrains engineering. (Russel & Taylor, 2011, pp. 17-25)

2.1.4 Revenue Model

While the value proposition and the value chain both describe of what the costs in a business model are composed of, the revenue model describes the income´s aspects. In detail the revenue model defines in which fashion this income is generated. The topic of investigation on which the revenue model is based, is the customers willingness of what and how to pay for an offered value. The price of an offering generally corresponds to the value appreciation by the customer. However, an offering´s price can be shaped in many ways thus creating different sensations for how much one pays for an offered value. It is the revenue model´s objective to maximize the income for a given offering. (Porter, 2014, p. 176 ff)

Wirtz (2006, pp. 70-74) classifies revenue models and distinguishes between direct/indirect and transaction-related/transaction-independent revenue models. In direct models the revenue is generated through a direct payment from the customer to the company. In indirect models the customer relationship creates a fringe benefit to a third party, which generates the revenue. Transaction related revenue models characterize revenues that can be linked to a distinct individual transaction. On the other hand, transaction-independent revenue models are characterized through customers paying a usage or membership fee for the offered value.

In addition, Osterwalder and Pigneur (2010, pp. 30-33) argue that there are revenue models with fixed and dynamic pricing mechanisms. The former are pricing mechanisms in which an offering´s price is predefined. Here, pricing is fixed a priori, but still depends on some static variables. Hence, the fixed pricing mechanism considers the quantity and quality of an offer, as well as additional product features. Moreover, the price can be adjusted to the type and characteristics of a customer segment. On the other hand, the dynamic pricing mechanism employs prices that change based on market conditions. Here, the price is set through negotiation and the corresponding bargaining power, which in turn depends on the supply and demand for an offering. In addition, factors such as inventory levels, the timing of the order or the urgency of the order can influence pricing. Furthermore, auctions also fall under the heading of dynamic pricing mechanism.

Summary Business Models

A business model is the representation of a firm´s underlying core logic (Shafer, Smith, & Linder, 2005, p. 202). It consists of four elements: the customer, the value proposition, the value chain, and the revenue model. A business model is characterized by the nature of its elements and how they are aligned with each other.

2.2 Business Model Innovation

According to O´Rourke and Karlson (2008, p. XVII) a business model 'is a living document that evolves with a dynamically competitive business environment'. Hence, static business models within dynamic environment are likely to fail, as the companies Nokia and Kodak ingloriously give evidence. Kodak at a time had a 85 % share of the then big market of analogue cameras, but they ignored to adapt their business model to the emerging technology of digital cameras, which ultimately lead to bankruptcy in 2012. Nokia was second to none in the mobile phone industry having a 40 % market share in 2008 before the smart phone era began. Their static business model and refusal to adapt to this uprising trend led to sales declines and their importance within the industry almost completely disappeared. (Kozielski, 2017, pp. 185-187). In order to not fall behind in markets and to maintain a competitive advantage '(…) business model innovation must be systematically cultivated, sufficiently supported, and explicitly managed' (Lindgardt, Reeves, Stalk, & Deimler, 2009, p. 1). To explain what business model innovation is Andreini and Bettinelli state (2017, p. 55): '*Business model innovation describes how the firm transforms itself with reference to where it was before and/or to the industry convention to pursue higher performance and competitive advantage that allow it to exploit opportunities.'*

Types of business model innovations

As there are multiple definitions and conceptions of the term business model, there are numerous conceptions of BMIs as well. Some authors divide BMI into the categories of innovations in technology, value network, and financial hurdle rate (cf. Koen et al. 2011, pp. 52-59). Gießen et al. (2007, pp. 27-33) categorize business model innovation in industry model innovation, revenue model innovation and enterprise model innovation. Others differ along the grade of innovation radicality. In this context, (Sergeeva, 2019) distinguishes between radical and incremental innovations. The former are, for example, market breakthroughs, whereas the latter represent small changes in the business model. For Gassmann et al. (2013, p. 7) business model innovation is given, when two out of the four elements of a business model (customer, value proposition, architecture of the value chain, revenue model, see 2.1) are modified or changed. Literature provides many more categorizations of business model innovation. However, all these categorizations have in common that they describe how a firm seeks new ways to compete on the market. In this regard Foss and Saebi (2015, p. 8) provide a general and apt statement: Business model innovation is a (…) '*realignment of activities, relations, routines, and contracts which results in a new configuration of how the firm creates and captures value that is the new to the product/service market in which the firm competes.'* Moreover, this statement corresponds to the interpretation of the term 'business model innovation' within this thesis.

Importance of business model innovation

Although there are different interpretations of business model innovation, all considered literature sources agree on the importance of business model innovation for a company´s success. In this regard, Lindgardt‘s research (2009, pp. 1-9) underlines the power of business model innovations and their long term impact on a company´s profitability. In their research they compared companies, which went through business model innovations, with companies, which incrementally innovated their products and processes. The compared companies compete in the same industry and the research team investigated the company´s profitability for its stakeholders over the time. The results indicate that companies which engage in business model innovation achieve higher stakeholder returns than companies which incrementally innovate their offering. The results of Lindgard´s research are illustrated in Figure 4 below.

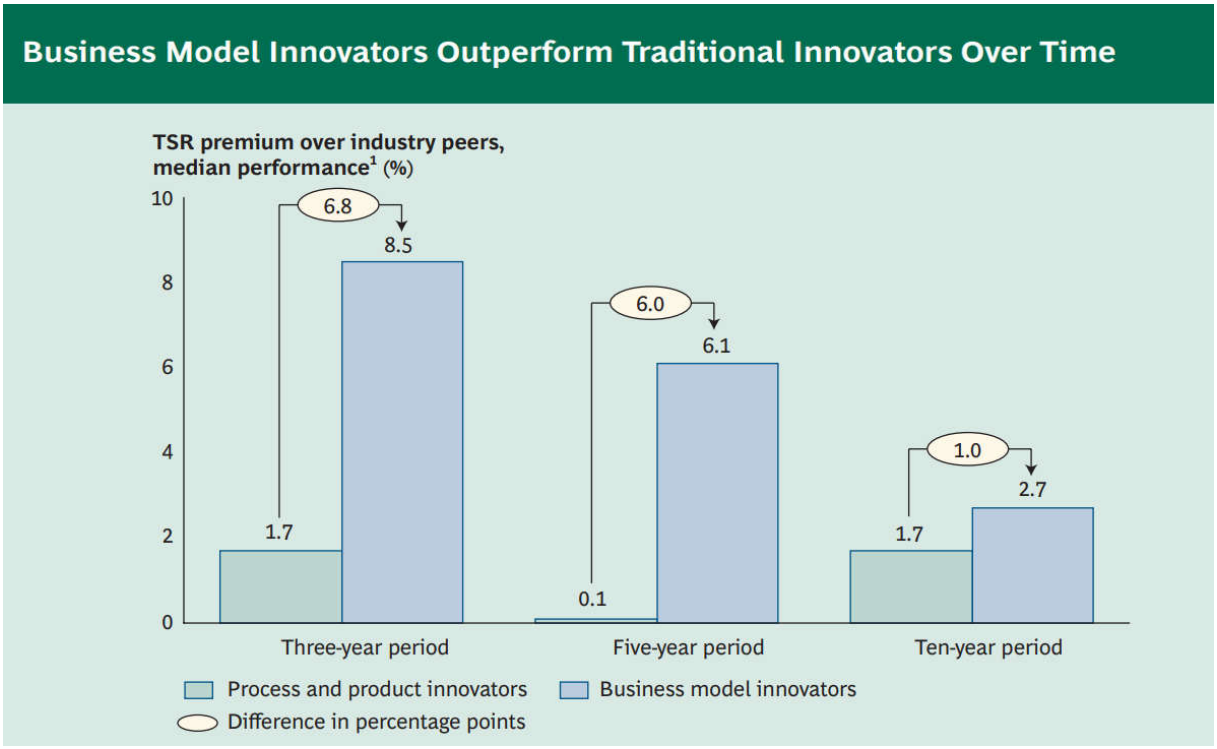


Figure 4 Business model innovators vs. traditional innovators (from Lindgardt et al. (2009, p. 3))

Here, the Total Shareholder Return TSR premium, is defined as the percentage by which innovator’s average total shareholder return exceeded that of their industry peers. It should be noted that the TSR premium gets smaller over the years, because innovations find imitators on the market. However, it is harder to imitate a business model than to imitate the mere product. In this context Giesen et al. (2007, p. 1) quote a CEO who notes: ‘*Products and services can be copied − the business model is the differentiator’*

In addition, business model innovation is a means of avoiding intense market competition. Indeed, innovating a business model or elements of it can lead to addressing a different market. Furthermore, it is possible that business model innovation leads to the creation of an entirely new market. (Vanhaverbeke, 2017, p. 17)

Summary Business Model Innovation

Companies engage in business model innovation to obtain a competitive advantage. Whenever certain elements of a business model are modified to gain economic advantage, it is referred to as BMI. There are different types of BMI regarding which element or activity of a business model is modified. BMI has been proven to contribute to businesses becoming more profitable. In addition, new markets can be accessed through BMI.

2.3 Data-driven Business Models

Since the stage gate process for business model innovation shall be particularly designed for being applied in the context of data-driven business models, this specific kind of business model is described in the following paragraph.

With the advent of technologies such as the Internet, social media, and various mobile devices, the amount of data generated by these technologies has grown exponentially over the past years (Hartmann et al., 2016, p. 1). The I.R. Management Association (2016, p. 766) estimates that the size of the 'digital universe' which comprises every byte that is stored somewhere in the world has increased from 1.200 exabytes in 2010 to 40.000 exabytes in 2020. In 2020 this corresponds to 5.200 gigabytes per person in this world. Gartner (2021) considers this amount of data as a '*high-volume, high-velocity and high-variety information asset'*. Data can hold all kinds of information. It can hold information about what car one drives, when this car was bought and last maintained. During a car ride, data can contain information about the engines´heat and its rotation speed. Moreover data can represent information about a company´s customer´s preferences but also about the customer itself. This information can be analyzed, and the insights gained therefrom can be commercially leveraged. Hence, these information assets hold embedded economic value that can be exploited like a source. In this respect the phrase 'data is the new oil' was coined (van 't Spijker, 2014, p. 1).

Business models that commercially utilize this data are reffered to as data-driven business models. In detail, a business model is a data-driven business model if it shows the following characteristics: Data represents the key resource of the business model, data analytics is the key activity that creates value for

customers, or data or information are part of the value proposition. (Fruhwirth, Ropposch, & Pammer-Schindler, 2020, p. 10)

Hence, the utilization of data and information characterizes the elements of a data-driven business model. To illustrate this in more detail Schüritz and Satzger (2016) described five 'data-infused' business model patterns, in which data beneficially impacts the elements of a business model. These business model patterns and their characteristics are shown in

Table 2 below.

No.	Category / Pattern	Short description
I	Data-infused Value Creation	Using existing or new data sources for optimizing value creation
II	Data-Infused Value capturing	Identifying new customer segments or utilizing new revenue models based on data and/or data analytics
III	Data-Infused Value Proposition via Capturing	Offering data-driven enhancements for existing products and services or entirely new data-driven services
IV	Data-Infused Value Proposition via Capturing	Using data to improve the value proposition and concurrently changing the way the BM captures value
V	New Data-Infused Business Model	Using data and analytics to develop an entirely new data-driven service by changing all elements of a BM

Table 2: Patterns of data-driven business models (Schüritz & Satzger, 2016)

An example of how a data-driven business model utilizes data, that is also relevant for the company of AVL is the service of 'predictive maintenance'. Here, data about e.g. a motor and its condition are recorded. These data describe, for example, how regularly the motor is used, which loads it drives and how its temperature and speed behave. Moreover, it is recorded how all this data behaves over time. Subsequently, this data can be analyzed upon which the maintenance intervals can be optimized. This data analysis represents the value proposition of a data-driven business model. (Glass & Callahan, 2015, p. 204)

2.4 Methods of Business Model Innovation in Practice

The following section describes two methods used for business model innovation. These methods represent textbook guidelines which provide techniques and anchor points for innovating a business model. Hence, the Lean Startup approach and the St. Galler Business Model Navigator are described.

These methods are selected because the stage gate process for business model innovation, which is to be adapted during this master thesis, incorporates inherent aspects of these methods. Accordingly, the stage gate process features the elements of formulating and testing hypotheses, creation of a minimum viable product MVP and the iteration cycle 'Build-Measure-Learn cycle', which are outlined by the Lean startup approach. The St. Galler Business Model Navigator is explained because the stage gate process shall stimulate the recombination of already existing business models, which is one of the core aspects of this method for BMI. The following sections are dedicated to these two methods and its inherent elements and aspects.

2.4.1 The Lean Startup Approach

The Lean startup approach takes its name from the lean manufacturing revolution that Taiichi Ohno and Shigeo Shingo are credited with developing at Toyota (Ries, 2011, p. 28). This manufacturing revolution introduced a new way of thinking and hereafter it was distinguished between value adding activities and waste. Value in this regard is defined as 'what the customer is willing to pay for' and waste as its exact antonym. Along this distinction, this manufacturing revolution established principles with a very goal-oriented focus. Additionally, as its name implies, all processes and actions are to be designed as lean as possible. As a consequence, 'by employing lean principles, Toyota was able to become the world's foremost car manufacturing company (Ries, 2011, p. II). Eric Ries, the originator of the Lean startup approach, adopted these principles for his entrepreneurial challenges driven and inspired by the success of lean principles. This resulted in 'the application of lean thinking to the process of innovation' (Ries, 2011, p. 15) and in the foundation of the successful Lean startup approach. In the following, this approach is described in more detail.

2.4.1.1 The five principles of the Lean startup approach

Eric Ries (2011, pp. 17-18) lists 5 principles, which form the basis of the Lean startup approach:

- Entrepreneurship and start-ups can be found in every company, regardless of branch or industry, ranging from garage-based firms to large corporations. Further, Ries defines a start-up which is 'a human institution designed to create a new product or service under conditions of extreme uncertainty' (2011, p. 37). If entrepreneurs are provided with the right environment, they can use the Lean startup approach to foster innovation in any company.
- The Lean startup approach is a way of management. Eric Ries dispenses with the preconception that innovation and entrepreneurship can only be realized through brilliant ideas. According to

him, ‘Start-up success can be engineered by following the right process’ (Ries, 2011, p. 12). Hence, the execution and management of an idea is much more important than the idea itself.

- The purpose of a start-up is to learn how to build a viable business model. Through continuous experimentation, entrepreneurs can test every hypothesis of their strategic vision and adapt it to the constantly changing environment: This so-called ‘validated learning’ is one of the core aspects of the Lean startup approach.
- The Build-Measure-Learn cycle: This is a feedback loop, which accompanies the start-up through all phases of its existence. Therein, start-ups ought to build elements of the business model at first. Then, customer feedback is inquired and measured. Subsequently, these measures are evaluated, and learnings are derived from them. The learnings help to answer the question whether to persevere or to pivot the business. This feedback loop shall be performed in short iterations and in a lean fashion.
- The innovation accounting: The last principle underlines once more the importance of the organizational aspects of innovation. Here it is important to maintain a good structure for recording the measurements to be able to derive further organizational issues, such as milestone timelines or prioritization.

The following describes the most important aspects of these principles and how they are interdependent.

2.4.1.2 The Build-Measure-Learn Cycle.

The Build-Measure-Learn cycle is a feedback-loop and the central element of the Lean startup approach. Completing an iteration through the cycle shall lead to validated learning. The resulting lessons learned help to iteratively improve the offering. Moreover, all parts of the business model are affected, as the lessons learned align and harmonize all building parts of the business model. Thus, the aim of the Build-Measure-Learn cycle is to create a competitive business model which can be rolled out and grow. Based on the lean principle, the cycle should be completed with as little effort as possible. However, to learn enough lessons from it, it should be completed fast and as often as possible. As the name implies, the Build-Measure-Learn cycle consists of the eponymous phases: Build-Measure-Learn. (Ries, 2011, p. 71 ff)

- Build: At first an offering is built. This is done in a very lean fashion and results in a minimum viable product – MVP. (The concept of MVPs is more detailly explained in the next section 2.4.1.3)
- Measure: Here, the principle of innovation accounting comes to the surface. A potential customer or user is confronted with the previously built MVP. Their reaction to it is then

measured which results in raw data. The section 2.4.1.4 ‘Engines of growth’ deals with the subject of which measures to focus on.

- Learn: Subsequently, the generated data is interpreted, and lessons are learned. This results in ideas how to refine and improve the MVP and the entire Build-Measure Learn Cycle. (Lang, 2016, pp. 328-331)

Figure 5 below illustrates the Build-Measure-Learn Cycle.

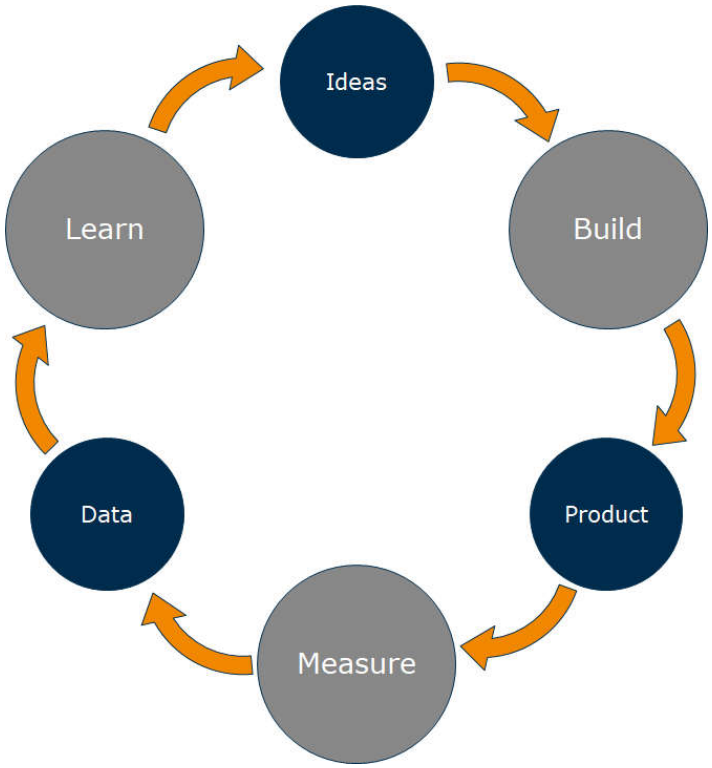


Figure 5 The Build-Measure-Learn Cycle. (modified from (Ries, 2011, p. 71))

2.4.1.3 The Minimum Viable Product

The Minimum Viable Product MVP is an abstraction of the offering used for experimentation. Within the five principles, the MVP and its creation play a very central role. At the beginning of a business plan every start-up formulates hypothesis, which subsequently are to be tested. The most important hypotheses are those about the offering´s benefits, the customer’s willingness to pay and the startup’s opportunities of growth. To verify and test these hypotheses, the startup builds an MVP. The MVP is the core element of the Build-Measure-Learn cycle and it supports the continuous learning process. It avoids waste and all functions that are not necessary, so that the feedback loop is completed in a lean

fashion with little effort. In the context of the lean manufacturing philosophy the term ‘waste’ refers to everything that does not contribute to validated learning (Ries, 2011, p. 55). This emphasizes the importance of validated learning, which can also and especially be achieved by errors and going wrong ways. However, it is important to keep these wrong ways as cheap as possible. The customer is then confronted with an MVP and their reaction to it is observed. Also, it needs to be closely monitored which features of the product the customer truly values and which increase the customer’s willingness to pay. After the customer interaction with this MVP the findings are evaluated. Subsequently, at this point the question ‘Pivot or Persevere?’ comes up. In case of *pivot* a stated hypothesis has been falsified and a new one is formulated that introduces more or less fundamental changes to the MVP or the business model itself. In case of *persevere* the essential elements of the business model remain the same and the MVP is merely refined or added a feature that shall test another hypothesis. After answering the question whether to pivot or persevere, a new iteration of the feedback loop starts. Through this process of validated learning the offering and the business model are developed very close to the customer, which results in a ‘Product-Market Fit’. This is the point at which the offering unfolds its full potential and opens up a large customer segment - ideally large enough to ensure the survival of the start-up.

Eric Ries describes three types of MVPs that have proven its suitability for testing hypotheses.

The ‘explainer video’ MVP

This MVP is a video of what the value proposition can accomplish, which is especially helpful for offerings whose benefits are not easily described with words. The video explains the intended offering and shows its functionality by illustrating a coherent user story. After confronting the potential customer with this video their resonance to it is measured and the customer demand can be evaluated. It is important to state that at the point, at which the explainer video is created, no feature of the offering must exist in reality. (cf. Ries, 2011, pp. 99-101)

The ‘Concierge’ MVP

This type of MVP simplifies and abstracts the value proposition by replacing automated components with human interactions. The potential customer experiences the value proposition by having a concierge providing its features. Every feature of the value proposition, including especially those which could be carried out by computers and machines, are delivered by a human servant. The ‘concierge MVP’ has two major benefits. On the one hand, it saves the resources for building the offering and on the other hand, the concierge acts in close customer proximity. This allows to really understand the customer and to evaluate his actual needs.

The 'Wizard of Oz' MVP

This MVP is suitable for testing value propositions which include human-computer interactions. Within this testing method the customer is interacting with the computer, consuming a digital offering. The customer believes to interact with a program or an artificial intelligence, while interacting with a human being, the 'wizard', who simulates the computer program. In this regard, the 'wizard' processes the customer's queries manually. At this point only the frontend of the software exists, and the backend has not been created yet. Like the 'concierge MVP', a human being replaces the automated components, but in contrast, the impression of the automated system can be maintained. In order to credibly simulate real time processing Gibbon et al. (1998, p. 18) state, that the task of the test scenario must be clearly limited. Therefore, the 'Wizard of Oz' experiment is most used for 'programs' that deal with speech recognition, language translations, train enquiries or similar.

2.4.1.4 Engines of Growth

After various hypothesis have been validated and invalidated by iterating the MVP through the 'Build-Measure-Learn' cycle, the start-up is confronted with the challenge of growing the business model. According to Barro and Sala-i-Martin Quelle cf. (2004, p. 1), growth is crucial to the long-term survival of a business as it attracts investors, eases the acquisition of assets, and drives the overall business profit. For the purpose of growth, Eric Ries (2011, p. 202) remarks that startups could seek to find new customers, to improve customer service, to higher overall quality or to decrease costs. To not fail by doing all at once or to not get stuck prioritizing, Erik Ries (2011, pp. 203-217) outlines three ways to facilitate business growth. These are named engines of growth.

- The sticky engine of growth
- Viral engine
- Paid ads engine

In accordance to the principle of Business Accounting (see principles of the Lean startup, section 2.4.1.1) he attaches a regarding set of measures to each way of growth. In the following each engine of growth is explained.

The Sticky Engine of Growth

Here, the growth is slow but steady. It is the aim to bind the customers on a long-term basis. This engine works for offerings with *'the expectation that once you start using their product, you will continue to do so*' (Ries, 2011, p. 204). An example for this are mobile phone service providers. When pursuing the sticky engine of growth, Eric Ries emphasizes two measures: The customer acquisition rate and the churn rate. The customer acquisition rate is the ratio between newly acquired customers and the number

of total customers at the beginning of the balance (Krause & Arora, 2010, p. 213). On the other hand, 'The churn rate is defined as the fraction of customers in any period who fail to remain engaged with the company's product' (Ries, 2011, p. 204). Hence, the underlying calculation is simple: If the acquisition rate exceeds the churn rate and the company attracts more customers than it loses, the company grows.

The Viral Engine of Growth

The Viral Engine is suitable for offerings with a high visibility. Similar to a virus, people are infected with the awareness of the offering. Thus, the customers themselves do the marketing for the offering. However, they do not do it intentionally in general, this happens by simply using the offering when seen by others. In some cases, customers are also incentivized with benefits to act as ambassadors and acquire new customers. Within this type of growth, the measure to focus on is the viral coefficient. 'The viral coefficient measures how many new customers will use a product as a consequence of each new customer who signs up' (Ries, 2011, p. 207). If the viral coefficient *v* is bigger than 1, the number of customers grows exponentially. If it is smaller than 1 the engine of growth will completely stop at some point. At exact *v=1* the numbers grow linearly. Figure 6 below shows the behaviour of growth for different viral coefficients.

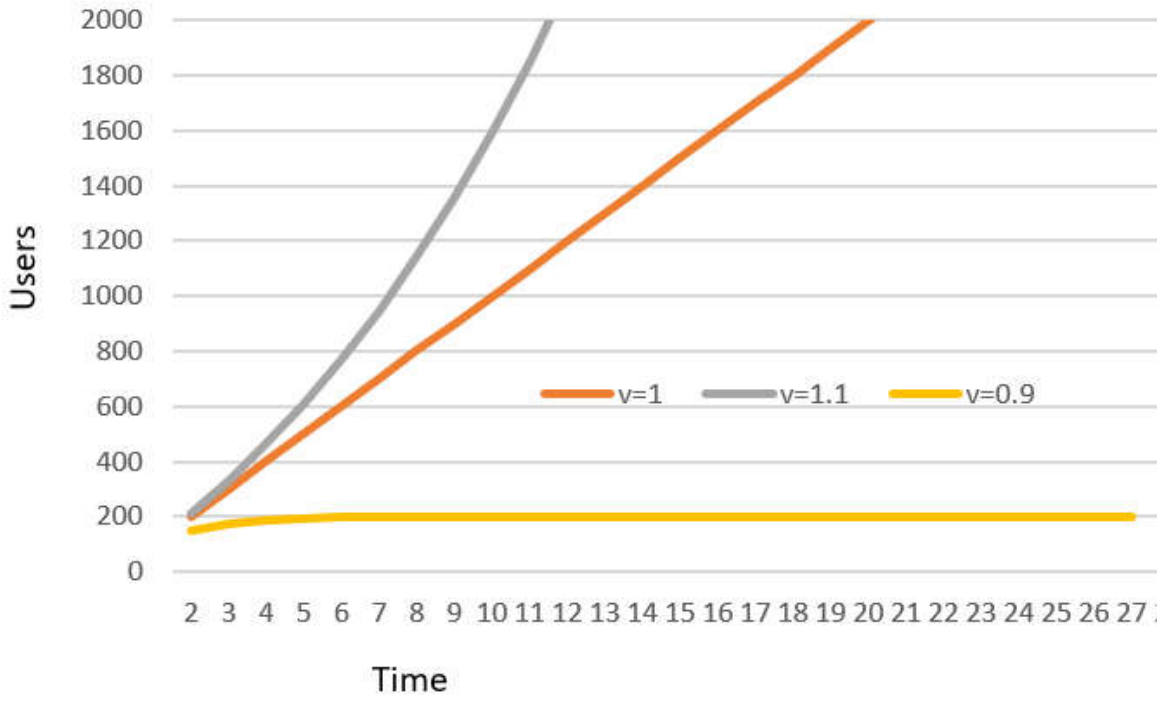


Figure 6 The Viral Engine of Growth (modified from (Ries, 2011, p. 207)

The Paid Engine of Growth

Unlike in the Viral Engine of Growth, the acquisition of new customers does not happen on its own. In the case of the Paid Engine of Growth it takes monetary efforts to acquire new customers. Consequently, the start-up must invest into marketing and sales. Advertisements, presence at trade fairs, free test versions or similar actions can be taken. In this regard there are two measures to focus on. On the one hand, it shall be evaluated how much it costs to attract a single new customer. On the other hand, it is important how large the margin of each customer is. Hence, the start-up can grow if the earnings per customer exceed the cost for their acquisition. To higher the profit start-ups using the Paid Engine can either seek to increase the margin or to lower the costs for the acquisition. (cf. Ries, 2011, pp. 208-210)

Summary The Lean Startup Approach

The Lean startup approach is focussed on learning what the customer demands. This is done by utilizing the Build-Measure-Learn cycle: First, hypotheses about the customer and the offering itself are formulated. Subsequently, these hypotheses are tested by building a minimum viable product MVP. The customer is confronted with the MVP and their reaction to it is measured. Based on these measures one can learn how to improve the offering and the business model.

2.4.2 St. Galler Business Model Navigator

Gassmann et al. (2013) have developed the St. Galler Business Model Navigator and published it in the book of the same name. The St. Galler Business Model Navigator is a methodology for business model innovation, whose structure is strongly inspired by the construction rules in mechanical engineering. The central message of this methodology is that you do not have to reinvent the wheel when it comes to business model innovation. This sentence refers to the fact that about 90% of all business model innovations are a recombination of various elements that already exist in other business models (Gassmann et al. 2013, p. 17). Therefore, the creative imitation and modification of already existing elements are of great importance within the methodology. The well-known deliverable of the methodology is the set of 55 cards that feature business model types, which inspire and facilitate business model innovation. (Subsequent paragraphs will explain them in more detail.)

Gassmann et al. (2013, p. 8) define business model innovation as following: An already existing business model is being innovated if two or more parts of the business model (Value Proposition, Customer, Architecture of the value chain and Revenue model; see chapter 2.1) and their configuration are altered. The methodology developed for this purpose is divided into four steps (Gassmann et al. 2013, p. 16):

1. **Initiation**
2. **Ideation**
3. **Integration**
4. **Realization**

Figure 7 below illustrates the four steps of this methodology. The first three steps are summarized within the design phase that are followed by the fourth step - the actual realization.

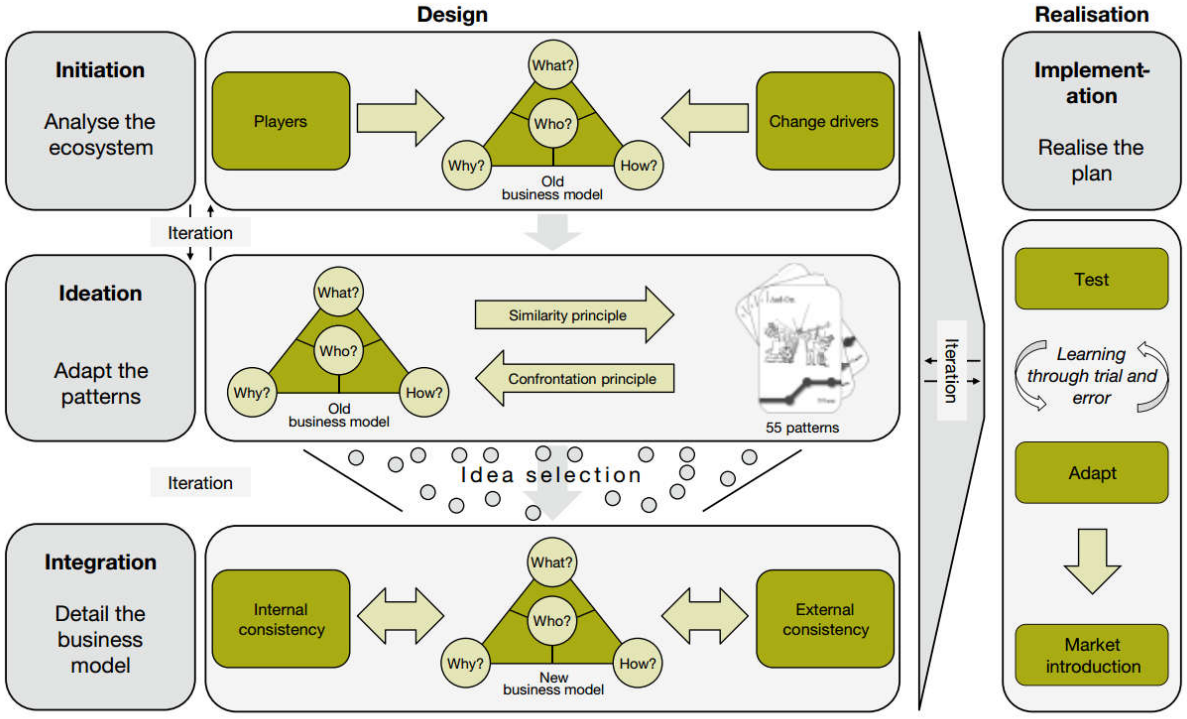


Figure 7 The St. Galler Business model navigator (Gassmann et al. 2013, p. 16)

2.4.2.1 Initiation

This phase represents the starting point and the search for the marching direction. Gassmann et al. (2013, p. 23) state that one can only innovate their business model if all aspects of it are well understood beforehand. Accordingly, the first step is to analyze the current business model and the ecosystem it is embedded in. Within this analysis, the right level of abstraction needs to be maintained. The business processes should not be investigated in its finest detail. However, the general logic behind the current business model is to be understood and all blind spots need to be enlightened. Consequently, this helps to understand the wider context of the business branch of the business model and the logic behind that. This exact knowledge of the business branch is a prerequisite to break out the dominant business logic and to make business model innovation possible.

The initial business model and ecosystem analysis comprises following points (cf. Gassmann et al. 2013, pp. 22-35):

- Current business model:
  It is to be analyzed **what** is **how** created, sold to **whom** and **how** this generates revenue.
- Actors: All actors within the business model and ecosystem need to be analyzed. These are:
  - Internal actors: Managers, Steering boards, employees, investors etc.
  - External actors:
    - Partners: Suppliers, Consultants, Sales Partners, Scientists (Gassmann et al. state that most business model innovations are results of collaboration with partners. An example of this is Apple collaborating with the music industry and the resulting launch of iTunes (Gassmann et al. 2013, p. 24).
    - Customers: The customers, their pains and needs must be carefully investigated
    - Competitors: Competitors of the same or similar markets need to be examined. Analyzing competitors and benchmarks can lead to successful imitation.
- Influencing factors
  All influencing factors that impact the business model or the ecosystem need to be analyzed. These are: market trends, legal issues, cultural or demographic aspects, politics etc.

2.4.2.2 Ideation

The next step is the ideation phase. The previously mentioned 55 cards with business model patterns now come into play. Each of the 55 business model patterns describes a specific configuration of business model parts and their individual design (Value Proposition, Customer, Architecture of the value chain and Revenue model; see chapter 2). In order to promote creativity and thus break out of the logic of the industry, these patterns should be applied and mapped onto one's own business model. As the parts of one's own business model have been analyzed in the previous step, they can now be rearranged according to one of the 55 patterns. (Gassmann et al., 2013, pp. 33-34) For this purpose, Gassmann et al. show two principles:

- **Principle of Similarity**

Finding ideas based on the principle of equality. Here, business model patterns are sought that are common in industrial sectors that have similarities to one's own. This could be, for example, high volatility in the financial industry, industries with high investment costs (e.g. rail transport) or service-oriented industries. These found patterns are then transferred to one's own and the question arises: 'What

change can be caused by transferring pattern XY in my business? The principle of equality enables business model innovations that are novel but not radical. (cf. Gassmann et al. 2013, p. 35)

- **Principle of Confrontation**

The idea generation with the principle of confrontation is as follows. Patterns are sought that have no similarities whatsoever with one's own business model and industry. These patterns are in turn transferred to one's own. Thus, the business model is exposed to and challenged by scenarios that are extremely unrelated to the industry. The aim is to break out of existing paradigms of thinking, which can result in a radical form of business model innovation. (Gassmann et al. 2013, pp. 36-39)

This process of mapping business model patterns onto one's own business models according to one of the two principles leads to a wide range of ideas. Subsequently, these ideas are discussed and evaluated. The most promising idea(s) are then further elaborated in the next step. (cf. Gassmann et al. 2013, pp. 39-42)

2.4.2.3 Integration

As the Ideation phase is only a rough brainstorming, the Integration step transforms the loose ideas into detailed business models. Each part of the business model is worked out in detail. Then an analysis is carried out in the same way as in the Initiation step. The new business model is checked to ensure that it is consistent and that the individual parts fit together seamlessly. Furthermore, it is theoretically examined whether the new BM is in harmony with its new environment. If this analysis has a positive outcome the next step is to realize the business model. (cf. Gassmann et al. 2013, pp. 44-49)

2.4.2.4 Realization

The realization outlined by Gassmann et al. uses similar concepts as described in the previous chapter. (Iterative testing using a prototype; comparative MVP, see chapter 2.4.1.3). Therefore, it will not be discussed in detail here.

Summary St. Galler Business Model Navigator

The Business Model Navigator is a process-oriented method for innovating business models. This is done in four steps (initiation, ideation, integration and realization). These four steps revolve around 55 cards with business model patterns. Hence, these 55 business model patterns shall stimulate the recombination of existing business models, which results in a business model innovation.

2.5 The Stage Gate Process

In 1986 Robert G. Cooper published and proposed a '*systematic idea to launch business process*' for the development of new products (Cooper, 2011, p. 9). This systematic '*idea to launch business process*' turned out to be successful and became famous under the term '*stage gate process'*. The stage gate process is a '*conceptual and operational map*' and a blueprint for managing the development process (Cooper, 2011, p. 121). Originally designed for structured product development and innovation, the *stage-gate* method has been adopted for many other application areas, all of which are related to innovation. (Cooper, 2011, p. 184). As innovation is essential for the survival and thrive of an organization (Dodgson, Gann, & Phillips, 2014, S. 3), it seems logical to emphasize the topic of innovation and to implement processes in this regard. Hence, the stage gate process is designed to improve the effectiveness and efficiency of innovation (Cooper, 2011, p. 121). Nowadays, 'Stage gate' is a registered trademark and has become the most widely-used business process worldwide (Cooper, 2011, p. 7).

Structure of the stage gate process

As the name implies, the stage gate process consists of stages and their corresponding gates. The stages are there to gather information and the gates represent decision points. As opposed to treating innovation as a black box, in which ideas go in and finished products come out, the stage gate structure splits the innovation process into a series of alternating stages and gates. Further, at each stage the resources committed to the innovation project are increased incrementally (Cooper, 2011, p. 147). The number of stages and gates is to be adopted to the project requirements (Shavinina, 2003, S. 704). Figure 8 below illustrates the stage-gate structure of an innovation process.

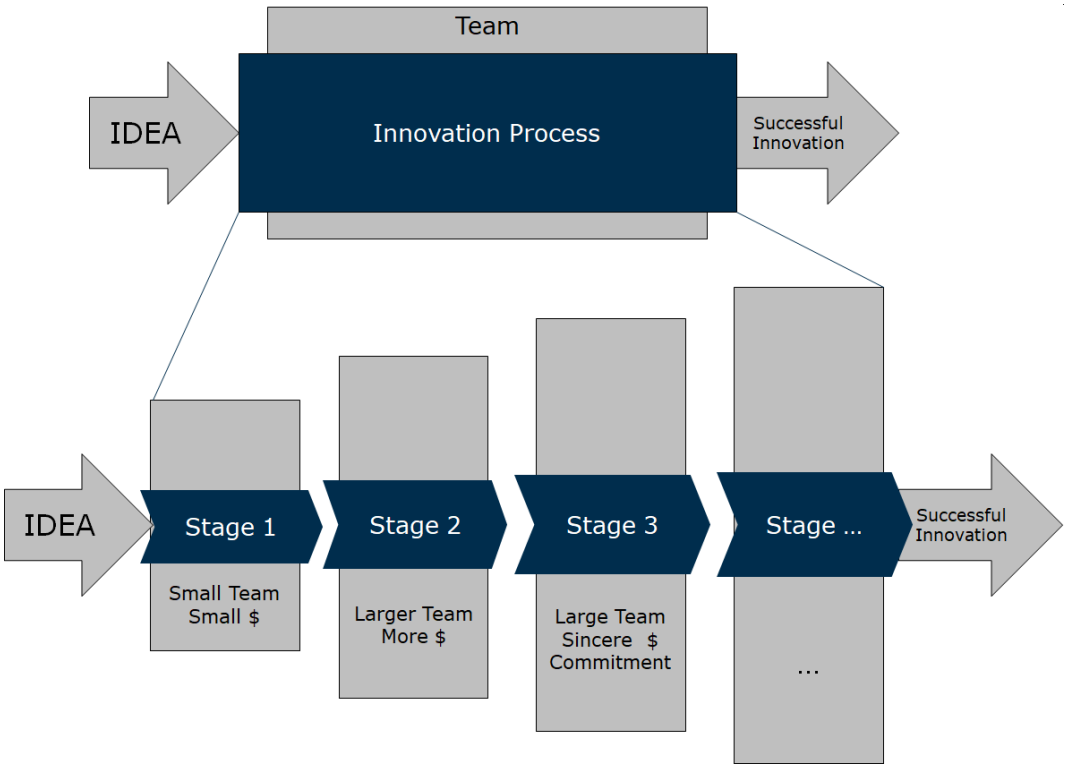


Figure 8 Stage gate structure of an innovation process. (modified from (Cooper, 2011, p.147))

The stages

Stages are groups of activities that are managed by cross-functional teams (Kerzner, 2009, p. 66). Their goal is to generate information. This information comprises various aspects - markets, technology, operations - making the stage a cross-functional one. Subsequently, this information is analyzed and then processed into deliverables. These deliverables represent the end of a stage, as they serve as input for the following gate (Cooper, 2011, p. 148). This sequence is illustrated in

Figure 9 below.

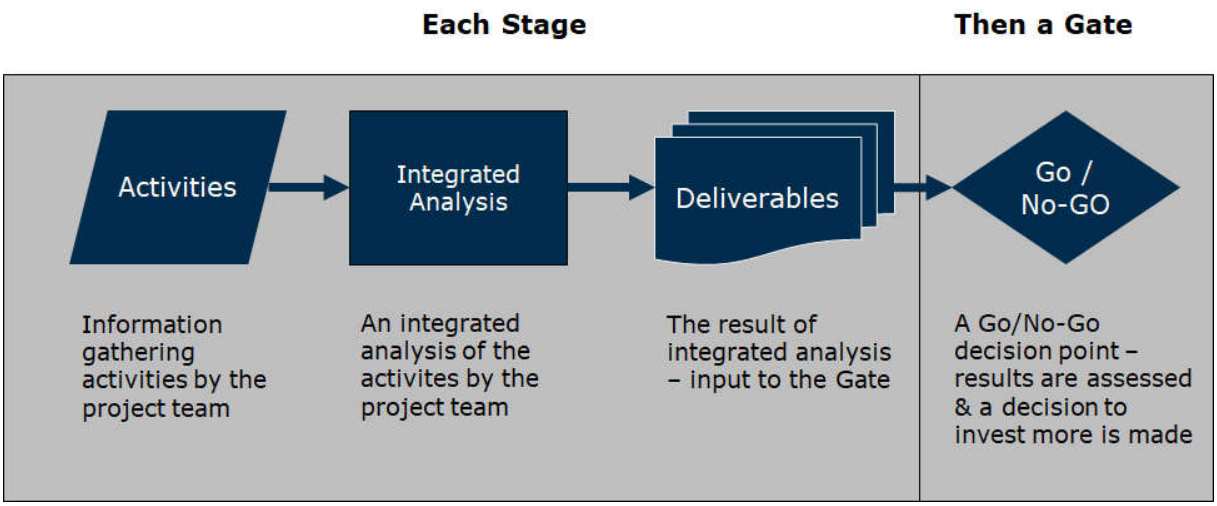


Figure 9 Structure of a stage within a stage gate process (modified from (Cooper, 2011, p.148))

According to (Shavinina, 2003, S. 704), each stage shall be dedicated to a specific project task with the ultimate goal of the product launch. Thereby, each stage costs more than the preceding one (Di Biase, 2015, p. 212). Cooper himself (2011, pp. 148-149), recommends to split the innovation process into 6 stage-gate phases. These are:

- Discovery
- Scoping
- Build the Business Case
- Development
- Testing and Validation
- Launch

Kerzner (2009, p. 66) adds a practical perspective and proposes that the number of phases must be aligned with the project scope. Hence, individual stages can be combined. This prevents that too much attention is paid to the preparation for each gate – attention, which should rather be given to the actual development.

Since the explanations of these six steps show clear parallels with the theories from chapters2.4, they will not be described in detail here.

The Gates

The Gates represent the end of a stage, respectively the beginning of the succeeding stage. They are ‘quality checkpoints’ (Cooper, 2011, p. 150) and decision points, at which the ‘Gatekeepers’ decide on how to further proceed with the project. Gatekeepers are individuals or groups that own the necessary

resources for the next stage or are authorized to make decisions about these resources. It is essential to mention that a project manager must never be his own gate-keeper (Kerzner, 2009, p. 67). According to Cooper (Cooper, 2011, p. 422), each gate shall have a common structure, which is shown in Figure 10.

Figure 10 Structure of a gate within a stage gate process (modified from Cooper (2011, p422))

Inputs: Each stage requires a prescribed list of deliverables that are elaborated within the preceding stage. The provision of the deliverables is the objective of the stage and the basis of the decision within the gate. Further it is important that the project manager and the gatekeepers have a common understanding about the nature of the deliverables and the input (cf. Cooper, 2011, p. 422).

Criteria: The given input is checked against predetermined criteria, that shall be visible and clearly understood by all (Cooper, 2011, p.422). The criteria answer questions about the current situation of the innovation project. These comprise the costs and timing of the project, the present and future risks and what assistance is needed by the management (Kerzner, 2009, pp. 66-67).

Output: The gates are designed to deliver clearly understandable outputs, which do not allow vague decisions Often referred to as a binary option -Go/No-Go-decision-, Cooper (2011, p 423) lists five possible outputs of a gate:

- **Go**: The project is approved, and the needed resources are committed. The next stage can be entered.
- **Conditional**: The project can proceed to the next stage if a certain condition is met within a given time frame.
- **Kill**: The project is terminated.
- **Hold**: The hold decision signals that the project passes the criteria, but there are other projects that are given higher priority and are therefore provided with resources for the time being.
- **Recycle**: The projects, or parts of it must be reworked. It will be rechecked against the gate criteria at a later point in time.

Seven goals of the stage gate process

By basing innovation on a stage gate process, Cooper claims that seven goals can be achieved (Cooper, 2011, p. 126-139).

1. Quality of execution

The given structure of a stage gate process enhances the quality of the innovation. This is immanently achieved by focusing on the relevant aspects of innovation. The stage gate structure ensures that the innovation is complete, and no key activities are skipped. Further, the gates ensure a certain quality of the underlying innovation project. Lastly, the stage gate by its structure draws the attention to the important components, which are noted in the criteria lists and the planned key activities. (Cooper, 2011, pp. 126-127)

2. Sharper Focus, Better Prioritization

By implementing a stage gate process, individual innovation projects within a company can be better evaluated and therefore prioritized. This is enabled by the quality check within the gates. As a result, the available and limited company resources are allocated to the most promising innovation project. (Cooper, 2011, pp. 128-129)

3. Fast-Paced Parallel Processing with Spirals

The stage-gate structure promotes parallel processing. This is made possible because at the beginning of each stage the key activities are fixed. Thus, everyone in the cross-functional team can perform their tasks and work in parallel. Additionally, the gates give the work a spiral pattern, as they stimulate feedback loops. The parallel work leads to a fast-paced processing and the feedback loops enhance the overall quality. (Cooper, 2011, pp. 130-131)

4. A True Cross-Functional Team Approach

The stage gate process ensures that the innovation project is a multifunctional approach. A successful innovation requires active participation from many functions within the organization. Being part of the stage gate process enhances the commitment and dedication to the innovation project. (Cooper, 2011, pp. 132-133)

5. A Strong Market Focus with Voice-of-the-Customer built In

The stage gate process places great emphasis on obtaining the customer's opinion. The clear objectives of the stages and the quality check in the gates make it essential to hear the customer's voice. (Cooper, 2011, pp. 134-135)

6. Better Front-End Homework

According to Cooper (2011, p. 136), most innovation projects fail or succeed in their very early phases. However, the largest sums of money are spent in the middle and late phases of the project. The stage gate structure does not let any project pass, which does not show carefully elaborated Front End Homework. This minimizes the risk of wasting too much money and resources on projects which ultimately fail. (Cooper, 2011, pp. 136-137)

7. Products with Competitive Advantage—Bold Innovations

Applying the stage gate structure to innovation ensures that the outcome has a competitive advantage on the market. In this regard the gate criteria are designed to verify product superiority, which higher the success rate of an innovation. (Cooper, 2011, pp. 138-139)

Summary The Stage Gate Process

A stage gate process aims to structure any given innovation process. Therefore, it is also suitable for business model innovation. A stage-gate process consists of several process phases in which predefined stage activities are performed. The results of these stage activities are then assessed by the subsequent gates. Therein, a committee with access to resources decides whether the innovation project is further continued, set on hold, recycled, or killed. The aim is to reduce the degree of uncertainty regarding the success of a development process within each stage.

3 Situation analysis: Analysis of the Stage Gate Process for Business Model Innovation before its Adaptation

This chapter deals with the initial situation of this master thesis and the tasks derived from it. Further, it describes how the idea of the stage gate process for business model innovation has come into existence. Subsequently, this chapter deals with the analysis of the stage gate process for business model innovation at hand. The process as it exists before its adaptation is first described in detail. Then it will be stated in which parts refinement is necessary to make the process ready for use within the company of AVL.

AVL List GmbH is the world´s largest independent company for the development, simulation, testing and integration into the vehicle of all types of powertrain systems. AVL is headquartered in Graz, Austria, and employs 11.500 people worldwide. Recently, AVL engages increasingly in new tasks such as autonomous driving and data intelligence. (www.avl.com, 2021) Due to this recent engagement in data intelligence, AVL senses the need to establish competitive and innovative business models in that area. Therefore, AVL was prompted to design the stage gate process for business model innovation.

The original idea of the stage gate process is to create a user-friendly guide for intrapreneurs, who want to successfully conduct business model innovation. The target users are AVL employees, who are responsible for innovative topics and the shaping of business models. Within the stage gate process, these users are guided in creating suitable business model for promising business ideas, while decreasing the risk of business failure. Since the designers of the process put emphasis on the decrease of business failure risk, they chose to feature the stage gate characteristic in which new resources are only spent if the business ideas meet all requirements. These requirements are set by the gates after each stage of the process. Moreover, the process is intended to provide its applicant with orientation as well as step-by-step guidance for efficient business model innovation. Furthermore, the features of the stage-gate process are specifically tailored to be used in the area of new technologies such as data intelligence. However, this stage gate process is not ready for use yet. This is because it has not been aligned with company internal specifics and some of its elements are incomplete. (Section 3.2 discusses the immaturities in more detail) Therefore, as mentioned in 1.1, the research question arose:

‘How shall a stage-gate process for business model innovation be designed in order to be implemented successfully at AVL?’

To get a better understanding about the stage gate process for business model innovation, Figure 11 below shows a depiction of the stage gate process before its adaptation. The main elements of the process are now going to be described in the following. These include the different phases, the stages, the stage activities, and the gate criteria.

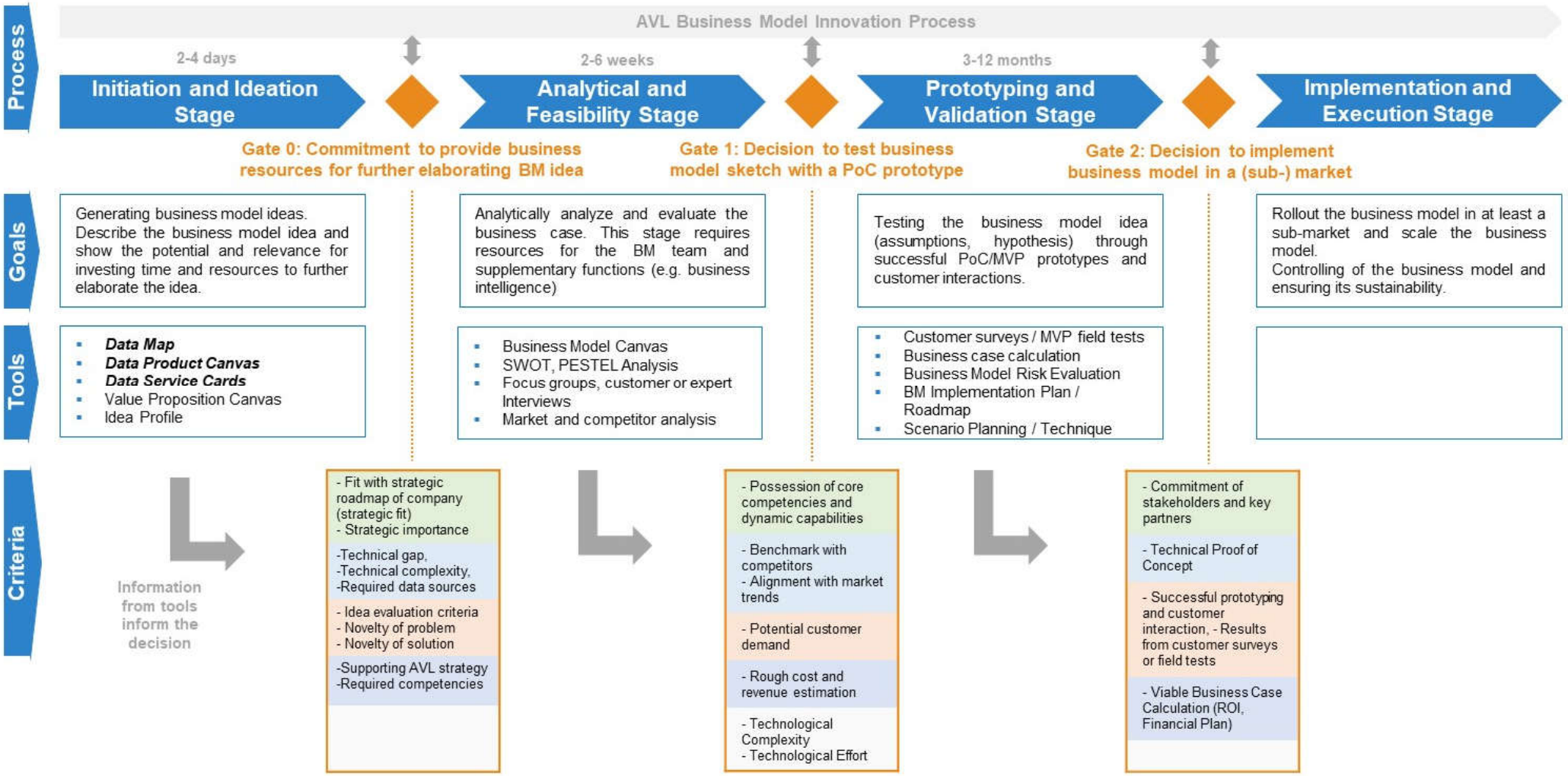


Figure 11 State of the AVL business model innovation process before its adaptation (source: AVL List GmbH)

The stage gate process consists of four stages with according gates:

- Initiation and Ideation Stage
- Analytical and Feasibility Stage
- Prototyping and Validation Stage
- Implementation and Execution Stage

Each stage requires the applicant to utilize several recommended tools and methods to gain insights in the various aspects of a business model, which in turn make up all four elements of the business model described in chapter 2.1. The gained insights provide information based on which the business idea´s prospects of success and its maturity can be assessed by a set of predefined questions and requirements within the gates.

In the following, the phases − the stages and their corresponding gates – that are illustrated by Figure 11 will be described in more detail.

3.1 Phases of the Stage Gate Process

3.1.1 Initiation and Ideation Stage

The Initiation and Ideation Stage aims to systematically mature a rough depiction of a business idea and to condense the initial substance into a solid basis. Answering basic questions about the offering and how it interacts with customers form the basis of a first business model draft. Further, customer analysis tools explore customer problems in more depth and describe how they should be solved. This stage is meant to provide the applicant with arguments why it makes sense to further pursue the business idea. The gate for this stage asks various questions about the competitive advantages of the offering and how it fits into the company's strategy. If all questions asked by the gate can be successfully answered, the business idea advances to the next stage.

3.1.2 Analytical and Feasibility Stage:

In the next step of the stage gate process the aim is to analyze the underlying business idea before actual technical developments take place. The second stage takes a closer look on which internal structures and capabilities are needed for the market launch. Subsequently, the internal analysis is followed by an external analysis, which puts focus on development and dynamics of the targeted markets and on all potential competitors, as well as external stakeholders. These kinds of analyzes combined with intensified customer investigation deliver information, upon which a suitable revenue model and the business´ financial structures can be formulated. An additional risk analysis either confirms or disproves

the elaborations so far. Summarizing all previously conducted steps, a preliminary business model with all elements belonging to it can be set up. As it is already the case in stage 0, all steps are accompanied with carefully selected tools, that force the applicant to take every aspect of a business model into account. Subsequently, the gate asks specific questions, assuring that all remaining insecurities have been resolved and if the product or service is ready for the market in form of a prototype.

3.1.3 Prototyping and Validation Stage

This stage supports the proof of concept of the underlying business model. A prototype is created and tested. Furthermore, the customer interaction and buying behavior is being investigated. Gathered feedback is systematically used for giving the last finishing touches to the business model or the offering itself. The final market launch is prepared and guided by tools like a Business roadmap and the utilization of the 'Scenario Technique'. Ultimately, the last gate assures whether the business model is commercially viable and mature enough for the market. According to the stage gate process the market launch can now be executed.

3.1.4 Implementation and Execution Stage

The last stage accompanies the final rollout of the business model in at least a submarket. Here, considerations are made on how to scale the business model and how to ensure its sustainability. The last phase, however, is less detailed. This follows from the fact that the main focus lies on the early phases of BMI.

3.2 Initial Situation of the Task Design

Since the topic of data-driven business models has only recently become relevant worldwide, the urge for having a structured approach is even younger. Therefore, the stage gate process described in the previous sections is a first theoretical draft, that has not yet been tested under real business conditions. The following chapter deals with the inherent immaturities of the stage gate process, that still exist due to its infancy. Further, it describes which aspects of the stage gate process need to be adapted to ultimately make it ready for use at AVL

Up to now the stage gate process for business model innovation consists of a few figures such as Figure 11 above, some sketches of recommended procedures and merely loose lists of gate criteria. (Attachment 2 shows the entire status of the process as it was before its adaptation.) In addition, ideas and implicit knowledge exist within the company on how to optimize the stage gate process. However, these are not yet integrated into the process. To further advance the stage gate process, the central task of the master thesis at hand is it to help the process mature to a state in which it is applicable in real business

environments. This includes complementing the implicit knowledge by conducting independent research as well as giving the process a coherent face and presentation.

Task design

The following further specifies the initial situation of the stage gate process and the basis from which the task design is derived. It should be noted that the task design is largely specified by AVL and was determined before the start of the master thesis. The objective of the author of this thesis within this situation analysis is to familiarize with the given conditions and to concretize the task design. Concluding, the task design specifies that the stage-gate process needs to be refined and adapted in the following aspects:

- Optimization of the structure of the process stages and the stage activities
- Completion and adaptation of the gate criteria
- Creation of a foundation of a process guideline: assisting explanations and recommendations for action

These three tasks have been set by AVL and will now be explained in short. After the description of these tasks, later chapters will deal with remedies of the three issues and detailed elaborations will be presented on a scientific basis.

3.2.1 Optimization of the Structure of the Process Stages and the Stage Activities

The structure of the stage gate process is still unsettled. It is not fully clear, which and how many stage activities, respectively business model development tools are included within the stages. Determining the number of stage activities is about finding a balance between the effort of the activities and the benefits they create. The selection which activities the stages include relies on various factors. It depends on which tools are already successfully established at AVL and therefore easy to use for the applicant of the process. Furthermore, it depends on which tools are particularly useful for innovating data-driven business models. Additionally, the exact economic branch and the circumstances of the business idea to be developed determine the selection of the stage activities. Ultimately, the sequence of the stage activities is not fixed. All these aspects of the process stages shall be optimized.

3.2.2 Completion and Adaptation of the Gate Criteria

The stage-gate process requires that the business model to be developed is evaluated against gate criteria after each stage. Prior to this master thesis, these criteria are incomplete and not yet adapted to the characteristics of AVL. However, the gate criteria shall reflect the immanent AVL culture, such as the affinity towards risk taking or the style of decision making. Further, the questions shall correspond with

the prevailing company strategy and main themes. Hence, it is the task to complete and adapt the gate criteria

3.2.3 Creation of a Foundation for a Process Guideline: assisting Explanations and Recommendations for Action

As the entire stage gate process is new to the working environment of AVL, there is a need for guidance through the process and its stage activities. Thus, an operating manual is to be developed. The operating manual (which will henceforth be called 'playbook') will provide information, tips, and best practices regarding BMI. Further, the playbook shall comprise AVL internal knowledge on the topic of BMI, which is made accessible to AVL employees. Moreover, the playbook shall guide the utilization of the business model development tools. It shall instruct at which point in time which tool is the most suitable. Hence, the playbook supports the general application of the stage gate process and increases the quality of its outcome.

Important note: At the time of writing this master thesis, the creation of the playbook is a major project at AVL. The playbook is called 'Playbook for Business Model Management' and includes several modules. The stage gate process is the core of the module of business model innovation. Due to the size of the project, it is not the task of this master thesis to cover this project in its entirety. The task of the master thesis is solely to contribute to the playbook and to prepare individual elements for it. These elements are:

- Textual and pictorial descriptions of the stages of the process
- Information flow diagrams describing what information is obtained from which activities and how they contribute to completing the stages
- Tool profiles, which describe how, at what time and with what prerequisites one should use the individual tool

4 Formulation of Objectives

This chapter deals with the formulation of objectives, which are pursued within the course of this master thesis.

The next step after analyzing the current situation is the description of the desired situation and the associated formulation of objectives (Ahrens, 2012, p. 9). Objectives declare what is to be achieved and shall be formulated as precisely as possible. Further, Schweizer (2008, p. 110) recommends defining various sub-goals that contribute to an overarching goal. Consequently, objectives are to be formulated independently from their solution. Moreover, the correct formulation of objectives is of crucial importance, as it enables the evaluation if something has been successful or not (Morcol, 2006, p. 182).

Upon this theory, objectives for this master thesis are formulated. At first the desired situation is described. Then, clear objectives are derived from it and presented in an objective hierarchy.

The desired situation:

AVL employees can access the finished stage gate process for conducting BMI. The individual phases are adapted to the needs of the users and the focus of the content is aligned with the management. The phases reflect what is already going well and support action in error-prone situations. The gates of the process evaluate the maturity of the business model according to the prevailing understanding of maturity within AVL. Furthermore, the questions assure that the business model is moving in the direction of the strategy issued by AVL. The playbook guides the applicant through the process, provides help if necessary and gives orientation. It also ensures that the stage activities are carried out correctly. This enables a coherent application and provides a central repository for information about the stage gate process.

Derivation of objectives:

For the derivation of objectives and to further visualize them they are put in an objective hierarchy. Schweizer (2008, p. 110) outlines following steps to create such a hierarchy:

1. Collection of objectives
2. Definition of overarching objective
3. Classification of objectives
4. Arrange objectives hierarchically
5. Control whether methods are not issued as objectives
6. Complete the target hierarchy and check it for completeness. Think from ‘top to bottom’

In the regard of this master thesis the overarching goal is to make the stage gate process for business model innovation ready for use at AVL. In order to concretize this rather abstract goal, it is divided into sub-goals. These sub-goals correspond to the task design of the previous section 3.2. These are the optimization of the structure of the process stages, the completion and adaptation of the gate criteria and the creation of a foundation of a process guideline. The optimization of the stage structure as well as the completion of the gate criteria are classified as objectives related to the content of the stage gate process. In contrast, the creation of the foundation of a process guideline is an objective which relates to the framework of the stage gate process. This merely supports the application of the stage gate process but does not influence its thematic focus. Further down the hierarchy the adaptation of the stages and gates are broken down into the collection of underlying requirements.

Figure 12 shows the results of the considerations above.

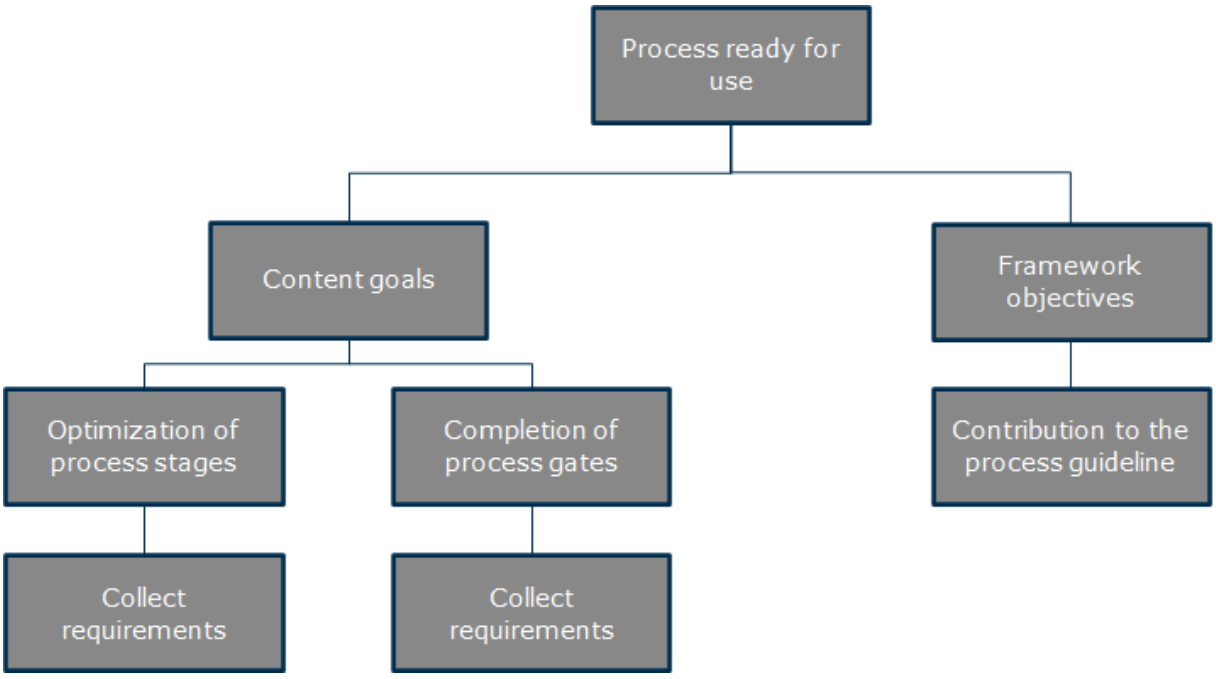


Figure 12 Objective hierarchy

5 Interview Series

This chapter deals with the interview series conducted on the topic of BMI at AVL. As a result of these interview series, the requirements are collected, based on which the stage gate process is adapted. Further, the chapter describes the methodology used to prepare, conduct, and evaluate the interview series. Finally, the interview results are presented.

To give an overview about the procedure within this interview series,

Figure 13 below gives an overview about the steps taken.

Figure 13 Procedure of the interview series (own illustration)

At first, the general goal and the desired outcome was defined. Based on that, the interview guide was created, and the interview modalities were determined. Then, an interview partner profile was specified, and the interview partners were selected accordingly. Subsequently, the interviews were conducted. All these steps are described in the Section 5.1 'Methodical procedure of the interview series'. Ultimately, the results of the interview series are shown in Section 5.2.

5.1 Methodical Procedure of the Interview Series

5.1.1 Goal of the Interview

The interview series aims to investigate the current handling of business model innovation at AVL. In chapter 2.4 common approaches of business model development were described. This theoretical background represents the basis for the questions in the upcoming expert interview series. The aim is to find out the parallels between the practical implementation in AVL and the theoretical description in literature. Subsequently, practices that have proven to be particularly useful will be discussed. Thereby, requirements for the process are raised implicitly. The adaptation of the process will be based on these findings. The process, its phases and the points addressed in it should reflect current practice in BMI. Finally, the interview partners are explicitly asked about their requirements for the process. The answers will influence the structure, contents, and framework of the process.

5.1.2 The interview Guide

The interview is conducted with the help of a guide which provides a framework for the collection and evaluation of the expert´s knowledge. The guided interview aims to collect qualitative as well as quantitative information with focus on the interview partner's subjective point of view. The qualitative part of the interview is characterized through open questions that the interviewee can answer and explain freely. The quantitative part consists of decision questions with the option for qualitative remarks that specify the answer if necessary. (cf. Gläser & Laudel, 2009, p. 111) The entire interview guide can be seen in Attachment 1.

Characteristics of the Interview Guide

An interview guide should consist of an introductory text, socio-demographic questions for the interviewee and main and sub-questions about the interview topic itself. The introductory text contains the introduction of the interviewer, information on the survey topic, the explanation of the motivation and the background of the interview, assurance of anonymity if necessary and a declaration of consent for the recording. The socio-demographic questions are followed by main and sub-questions that are arranged like in a natural conversation. (cf. Bacher & Horwath, 2011, p. 43 ff)

The interview guide shows the following characteristics:

- The guideline contains openly formulated questions that are asked neutrally to the interviewee so that no answer is suggested to them. (cf. Gläser & Laudel, 2009, p. 135)
- With the help of the guideline it is attempted to find out implicit knowledge of the interviewee. (cf. Katenkamp, 2011, p. 199)
- If necessary, the interviewer can change the order of the questions if the course of the interview requires it. (cf. Gläser & Laudel, 2009, p. 150)
- The interviewer is free to spontaneously ask more specific follow-up questions. (cf. Hopf, 1978, pp. 107-111)

On that basis, the interview guide has been created. Considering the previously described goal − to collect the design requirements for the stage gate process − the interview guide comprises three leading questions:

- How is business model innovation being done at AVL?
- What best practices and lessons learned in the field of BMI are there?
- What requirements do employees place on processes to make them as user friendly and as much likely to be used as possible?

Further, Gläser and Laudel (2009, p. 146) recommend to divide the interview guide into themed blocks. Hence the interview guide is divided into four parts, which aim to answer the leading questions.

Parts of the interview guide

1. The first part is of introducing character and is dedicated to general demographic information about the interviewee. This part deals with the interviewee´s educational background, current position within the company and responsibilities. These socio-demographic questions shall collect meta data about the interviewee that subsequently help to classify and process their answers.

2. The second part is about the interviewee's understanding of the terms 'business model' and 'business model innovation'. Their approaches to these topics, as well as their experiences shall be shared. Here, the aim is to chord the party's respective understanding of the topics at hand. Furthermore, it is asked which challenges within these topics the interviewee is confronted with and what remedies are used.

3. Thereupon, the third part, which is the quantitative part of this interview, deals with the tools the interviewee applies for business model innovation and their positive or negative corresponding experiences. The decision questions of the quantitative part are then supported by open questions that ask for the reasons behind the interviewee´s judgements. The gained insights aim to ease the subsequent selection stage activities for the process´ adaptation.

4. Finally, the fourth part is dedicated to the interviewee's experience in the field of business model innovation. With respect to a completed project, in which the interviewee has participated, it is asked in detail how the interviewee conducts business model development in practice. Consequently, the questions aim to find out best practices and lessons learned on this instance. Further, the interview guide evaluates whether structured processes or elements of it were used in this regard. On a general level it is also inquired how structured processes need to be shaped to serve their purposes. These insights provide the major basis for the adaptation of the stage gate process.

5.1.3 The Interview Partners

For the selection of interviewees, the directives of Gläser and Laudel (2009, pp. 117-120) were used. Accordingly, all selected interviewees should show expertise in the relevant topic and show availability to share these in an interview. Further, it must be made certain with the selection of the interviewees that they are not in a hierarchical relationship to the interviewer, which could distort the information.

Furthermore, Gläser and Laudel warn against selecting interview partners with whom one maintains a personal relationship. In this context, Seidmann (1991, p. 31) adds, that a certain distance between interviewer and interviewee is necessary in order not to assume anything as a self-evident fact.

To further specify the search for suitable interview partners a required profile of possible interviewees has been created. Since the research question is to be answered based on the practices at AVL, all interviewees must work at AVL List GmbH. Further, as the stage gate process especially supports data driven business models the interviewees shall work in digitalization-related business fields.

Summing up, the interviewee's profile is:

- The person works at AVL
- The person works in the data-driven business field
- The person has experience in the design of business models and/or business model innovation

With these described criteria eleven interviewees were selected. For the purpose of gaining different points of view on the same topic, the interviewees hold different positions as outlined by Gläser und Laudel (2010, p. 117). These range from product developers, innovation managers to strategic positions such as program managers. Additionally, within all interviewees, different experience levels are comprised, and the interviewees have various educational backgrounds. None of the eleven participating interview partners has a hierarchical relationship with the Interviewer, whereby a personal relationship exists with one participant (Expert 10).

5.1.4 Conduction of the Interviews

As a next step the actual interviews took place. The interview procedure was consistent throughout the series. Before the interview, the interviewee received the interview guide via email, so that they could prepare for it in advance. This ensured that the interviewees went into the interview with a sense for the interview's objectives. Within the interview, it was first evaluated how the interviewees interpret the terms 'business model' and 'business model innovation' to have a common understanding of the underlying topics. All eleven interviewees named interpretations that correspond with the interpretation of these terms used within this master's thesis. After being in accord with the interviewees regarding terminology, the interview moved on to its actual content. Due to the global Corona virus crisis that was present at the time and the related policies to it, the interviews were conducted via Skype and recorded. All interviews were held in German, with one exception, that was held in English. On average, the interviews lasted 52 minutes. Table 3 below shows the relevant metadata of the interview series and the interviewees.

Pseudonym	Personal Data				Interview		
	Age	Job description	Educational background	Sex	Interview duration	Interview language	Form of the interview
Expert 1	31	Team Leader	Business Administration	female	48 min	German	Skype call
Expert 2	40	Global Head of Department	Automotive Engineering	male	63 min	German	Skype call
Expert 3	42	Software Product Manager	Media Technology	male	50 min	German	Skype call
Expert 4	41	Global Business Segment Manager	n/a	male	48 min	German	Skype call
Expert 5	43	Program Manager-Business Development & Marketing	IT & IT-Marketing	male	45 min	German	Skype call
Expert 6	31	Project Manager	Technical Physics	female	43 min	German	Skype call
Expert 7	51	Solution Manager	Telematics	male	68 min	German	Skype call
Expert 8	45	Development Manager	Mechanical Engineering	male	51 min	English	Skype call
Expert 9	44	Product Line Manager	Computer Science	male	54 min	German	Skype call
Expert 10	30	Product Manager	Electrical Engineering	male	61 min	German	Skype call
Expert 11	56	Director of Electrification	Electrical Engineering	male	47 min	German	Skype call

Table 3 Metadata of the interviews and interviewees

5.1.5 The Interview Analysis

The interviews are analyzed according to the method of qualitative content analysis by Meuser and Nagel (1991). The choice of the method is based on the special interest of the expert interview in obtaining knowledge about a certain topic (Meuser & Nagel, 1991, p. 457 ff). As the interviewer approaches the interview unbiased about the topic of BMI, this method is a suitable one. Further, this method fits best to the selection of the interview partners with their various backgrounds and different positions and the interview circumstances in general. This follows from the fact, that this specific method extracts the essential points of the interview, which enables a valuable thematic comparison. In

the thematic comparison, statements that belong together in terms of content are summarized in units, regardless of the text passage in which they fall. Thus, the methodology according to Meuser and Nagel is particularly well-suited, as on the one hand, the guideline-oriented interview ensures comparability of the statements and on the other hand, the aim of this method is to filter out similarities and differences. (Meuser & Nagel, 1991, p. 476)

Meuser and Nagel (1991, pp. 455-462) outline four steps for an interview‘s analysis. These are described in the subsequent paragraphs. A fifth step is added for translating purposes.

1. Transcription

Initially, the recorded audio files are transmitted to text form. This transcription is necessary to preserve the collected data and to make it accessible for further analysis. Here, it is important to bring the data to paper with respect to reflecting the given situation and content of what has been said. It should be noted, however, that what was not transcribed is lost as information for the evaluation. The next step is to check the transcription. The transcripts are compared with the recordings and improved regarding hearing defects. In this step it is also possible to anonymize personal issues if that was the wish of the interviewee. Finally, the transcription documents are checked once again in order to eliminate any possible ambiguities or inconsistencies.

2. Paraphrase

The main goal of paraphrasing is to reduce the complexity and length of the transcripts, which subsequently facilitates the evaluation. The texts are arranged according to thematic units and assigned to the thematic blocks of the interview guide. Based on the text, the content is then reproduced in one´s own words. Long passages can be simplified to the core statement, even if the expert elaborates on the topic lengthily. It should be noted that ‘nothing is withheld, nothing is added, or nothing is distorted’ in the process.

3. Headlines

In a further step, the paraphrased passages are labeled with headings. Here, each interview’s paraphrase is processed separately. Within this process the headings shall be created with respect to the terminology used in this specific interview. It is noted that a passage can be labelled with more than one headline, depending on how many topics are discussed in it. This labelling process condenses the material to be evaluated.

4. Thematic comparison

In this last step similar passages and their corresponding headlines are searched. After similarities have been detected, standardized headlines are to be found and formulated. This is done using a generic terminology. With the standardized headlines, the actual comparison can now take place. Similarities are highlighted, deviations, contradictions and differences are recorded in detail. The aim is to determine where the statements of the experts coincide, where they have different positions and which topics are answered individually.

5. Quotation

Lastly, an additional step was taken to enable quotations from the interviews, which were mostly held in German. The following procedure was conducted for this purpose: The German citations relevant for the evaluation were collected in a table. The entire paragraph from which the citation originated was adopted in order to retain the context of the citation. The citation was then translated from German into English and presented to AVL responsibles for verification. After possible corrections, the quotations can now be used for the evaluation of the interviews on a scientific basis.

5.2 Interview Results

As mentioned in 5.1.2, the leading questions of these interview series are:

- How is business model innovation being done at AVL?
- What best practices and lessons learned in the field of BMI are there?
- What requirements do employees place on processes to make them as user friendly and as much likely to be used as possible?

Before the results are shown, let the background and objectives of the individual questions be recapitulated.

The first leading question deals with how to approach the matter. It will be determined whether textbook methods are used and if so, which ones. Furthermore, it will be determined which individual steps are used in practice and which ones turn out to be particularly useful. In addition, it will be asked which subjects are of importance within BMI. The next point are tools used within BMI. Here, it is examined which common tools are used and what to pay attention to when using them. Furthermore, it is asked under which conditions uprising business ideas are assessed and further continued. This information helps to design the gate criteria within the process. In general, all these questions and the information gained from them form the basis, on which the subsequent adaptation of the process is carried out. After all, the process should reflect the prevailing practices in BMI at AVL and give them additional structure.

These prevailing practices have been confirmed to be successful by the interviewees and should therefore be incorporated in the process.

The second leading question deals with the lessons learned and best practices within BMI. As described in Chapter 4, the goal is to contribute to a playbook that helps the applicant navigate through the process. The answers to this question are the basis for this playbook. These are then presented as tips, tricks, and recommendations for successful BMI. This compilation of lessons learned, and best practices represents a concentrated source of knowledge that should be made available to AVL employees for the purpose of BMI and provide them with orientation within the process.

The first two leading questions aim at implicitly identifying design requirements for the process. The third leading question asks the interviewee directly how the process should be designed to make it as user-friendly as possible. In broad terms, this question refers to the general conditions and presentation of the process rather than to aspects of content. These answers can then be used directly to adapt the process.

The following sub-chapters will summarize the collected answers to the corresponding leading questions. A consistent structure is maintained for this purpose. Each leading question with its subordinated questions is individually discussed in separate sections. At the beginning of each section the most frequently recurring themes are described and displayed in a table. Therein, the listed themes are the result of a frequency analysis as outlined by Mayring (2015, p13 ff) Moreover, these themes correspond with the headlines, with which the statements were labeled, as described in section 5.1.5. It is mentioned that these themes are not only displayed because of their mere frequency, but also because the qualitative statements of the experts support their importance on the given topic.

Subsequently, these headlines are underlined with statements of the interviewees, which are put into context and evaluated. This is done by distilling the essence of the interview statements (Flick, 2014, p. 304). In addition, these statements are considered in the light of prior research, that is represented in the theoretical part of this thesis in chapter 2. At the end of each chapter there is a summary. In addition to the summary of what has been said, the significance of the results for the stage gate process is described

5.2.1 How is Business Model Innovation being done at AVL?

General Approach in Business Model Innovation

The investigation of the general approach to the matter shows that most interviewees follow the Lean startup approach. Its elements of formulating and testing hypotheses and the creation of an MVP are often highlighted. Furthermore, the elements of customer proximity and iterative proceedings are

underlined. These elements are partly addressed independently of the literature method by some interviewees. Lastly, the necessity of a precise market analysis is mentioned.

Recurring themes

• Following the Lean startup approach
a.) Maintaining customer proximity
b.) Formulating and testing hypotheses
c.) Iterating the business model innovation
d.) Creation of an MVP
• Market analysis

First, the general approach on how AVL´s employees conduct business model innovation was discussed. Regarding the actual modus operandi, three interviewees quoted the Lean startup approach as their means of choice. In this regard, Expert 1 stated:

> ‘We follow the Lean startup Approach: We focus very strongly on the customer and build an MVP - these are 'Proof of Concept' projects. We constantly collect feedback. This can be called ‘incremental business model innovation’. We make hypotheses and test them − Build Measure approach. Building and testing hypotheses costs nothing, which is why it is so popular with startups.’

Expert 2, taking the same line, further elaborated:

> ‘Keep the ideation and definition phase very short and then get straight into testing. Testing and validation is best carried out with the customer. Consult with superiors at an early stage and generate commitment. Take little time for analysis. An MVP should be created at an early stage, which should then be brought closer to the customer in a confidential manner so as not to ‘show your colors’. Trial and error is key.’

Expert 3, who also follows the Lean startup Approach, additionally outlined an interdependence between the production costs of the underlying offering and the involvement of the customer:

> ‘We then iterate the business model through many customer conversations. The higher the production costs are, the more likely it is that I will have to consult with the customer. I also follow the Lean startup approach and build MVPs.’

Without naming the Lean startup approach four more interviewees implicitly follow elements of the Lean startup approach. Expert 4, in this regard, emphasized the elements of MVP creation and iterative customer feedback. Expert 5 and Expert 6 both highlighted the MVP creation in their approach to business model innovation. Expert 7, 10 and 11 are particularly fond of the hypotheses testing when innovating a business model.

The two remaining interview partners (Expert 8 & 9) pursue approaches, that do not have any distinct overlaps with the Lean startup approach. Expert 8 deals with business innovation by bundling partly-established value offerings in a service package. His approach consists of performing several analyzes regarding market, customers, and internal and external stakeholders. These intensive analyzes done upfront replace the creation of an MVP at the early stages in the business model innovation process. Another reason why there is no MVP is the fact that the individual value offerings have already been established on the market.

Expert 9 comes from a '*rather conservative background*' in terms of how he has familiarized with business models. He is a genuine technician who used to sell engineering service paid by the hour. Only recently he has come in touch with data-driven related business fields, as he does the engineering within a fleet monitoring project for example. In his approach to BMI, he primarily wants to outbreak the conservative business model by seeking opportunities to scale his offering:

> 'But we also try to establish scalable business models: Buying data somewhere and reselling it multiple times as a license solution or pay per use. But it must fit into the engineering structure. (...) This was driven by market pressure and internal innovation. Benchmarks were made.'

Summary: General Approach in Business Model Innovation

The Lean startup approach is the predominating method in the field of data-driven business fields at AVL. Nine out of eleven interview partners explicitly or implicitly follow the teachings of this approach. This is not surprising, since the field of data-driven business affairs is comparatively young and therefore only attracts entrepreneurs who treat their projects like a startup. The interesting outcome, however, is that the Lean startup approach is being followed, no matter if the underlying subject is to develop a business model from scratch or to innovate already existing business model. An explanation for this is the high granularity of the Lean startup principles/elements. The elements, which are described in detail in 2.4.1, of 'Build-Measure-Learn' and 'Customer proximity', are applicable in many instances, as shown by the interview results. Concluding, the key finding of this part of the interview's results evaluation is the prevalence of the Lean startup approach. This is to be considered for the subsequent adaptation of the stage gate process design.

5.2.1.1 Decision-making Process within Business Model Innovation

Within the leading question of how BMI is done at AVL, the topic of decision-making was discussed as well. After the general approach on BMI has been investigated, the focus was then shifted to the question on how the decision-making is shaped. The interviewees were asked how business ideas respectively business models are assessed. Moreover, it is analyzed under which circumstances promising business

models were further continued and when business models were discarded, if necessary. The background of this interview section is to create a basis, on which the adaptation of the goal criteria can be done.

According to the experts, the decision-making process favors business ideas, which have identified strong customer need. Alignment with the corporate strategy contributes just as positively to decision-making as the reuse of existing elements. Networking on a personal level also influences the decision-making. Further, the procedural conditions of the decision-making process within AVL are investigated. This is conducted like in the TV show 'The lion's den'.

Recurring themes

• Proper conduction of a customer needs assessment
• Alignment with corporate strategy
• Reutilization of elements that already exist within AVL
• Gather commitment from superiors by using networks in which ideas are promoted
• Decision making conducted like in 'The Lion´s Den' in which the VPs form the committee

When it comes to evaluating business models' prospects, there is an aspect, on which all interviewees explicitly agreed and which they also emphasized. Accordingly, the positive outcome of a customer needs analysis is a key indicator for future success of a business model. All eleven interview partners said that this analysis forms the basis of a 'Go or No-Go' decision. Expert 8, in this regard, highlighted the importance of the customer needs analysis and outlines its interconnection with the analysis tool 'Value Proposition Canvas' VPC. In this case the needs analysis has been done by conducting customer interviews:

> 'Conducting the interviews made it clear that there is a big customer need. That was the driving measure. While filling out the Value Proposition Canvas all blocks of it were filled with what felt like potential.'

Expert 3 further elaborated when to deal with a customer needs analysis:

> 'Is there any demand at all? Is there a willingness to pay? […] At the beginning this question can only be answered roughly, but it should accompany you throughout the whole process and be asked again and again.'

Expert 9, taking the same line, added:

> ‘It helps me to make a decision if a needs analysis is positive or if competitors already offer it, but it is difficult to make a decision on new topics.’

The alignment of business models with the corporate strategy is another key aspect of the decision-making process. Four interviewees explicitly highlighted its importance. Expert 6 in this context exemplified:

> ‘Things are often prioritized very strongly within the company. This depends largely on whether this project fits into the company strategy or not and whether it finds internal drivers. This can be found out through discussions.’

Expert 4 further explained the AVL internal distribution of resources, which is linked to the corporate strategy:

> ‘There are also IFA's Innovation Focus Areas whose strategy guidelines should be followed. These also include a budget for innovations, and you have to hope that your project will be supported.’

Expert 6 emphasized the reutilization of elements that already exist within the company in order to be aligned with the corporate strategy. This also has a positive effect on the ‘Go or No Go’ decision as she elaborated:

> ‘Such a spider diagram has also been very helpful for decision making: It features all the tools that my project combines. These are tools from other departments and therefore, each department felt appreciated, which is a good basis for a decision. In this way it is shown that existing tools are used, and the wheel is not reinvented.’

As exemplified in this statement the interviews show that internal networking positively influences the decision-making process. Three interview partners were vocal about this aspect. For instance, Expert 5 stated: *‘Networking within the company for your own project is extremely important. You have to find multipliers of your interests*.’

Further, the setting of the decision-making process was discussed. Four interview partners said that business ideas respectively business models in their departments are assessed in the same way one knows from the popular TV show ‘The Lion’s Den’. In this TV show business ideas are pitched in front of a committee that decides whether to finance the idea or not. Expert 1 showcased the modalities converted to AVL and she adds what to focus on when pitching:

> ‘This is yet another presentation to the Vice Presidents in the steering committee. It takes a quarter of an hour and I really like this process – you get to the point quickly and have a quick decision. For this presentation you need a clear business model and a potential ROI.’

It shall be stated that this decision-making process is new to the company and has only been established recently in some departments. (September 2020).

Summary: Decision making process within business model development

A central element of how business models are assessed is the customer needs analysis, as it is emphasized by all interview partners. Four interview partners highlighted the importance of strategy alignment. Two interview partners outlined the benefits of internal networking and another two mentioned the value of reutilization of already existing elements within the company. Four interview partners mentioned the decision-making process, which is modeled on the TV show 'The Lion's Den'. These insights will prove helpful for the subsequent adaptation of the stage gate process.

5.2.1.2 Evaluation of the utilization of business model development tools

Within the leading question of how BMI is done at AVL, business model development tools were discussed as well. Hence the next part of the interview dealt with the handling of these business model development tools used for BMI. The investigation showed that the tools are used for precisely analyzing the market. Further, AVL´s employees emphasized the correct usage of these tools. Moreover, the iterative character of the tool´s usage was discussed. Finally, the wide spread of the Business Model Canvas BMC and the Value Proposition Canvas VPC was mentioned.

Recurring themes

• Market analysis
• Education for and within a process
• Iterating the business model innovation
• Wide spread of the tools BMC & VPC

In the next part of the interview it was investigated which business model development tools are being used within business model innovation. This was done by collecting quantitative as well as qualitative data. The quantitative data was collected using the questionnaire which can be found in the interview guide (Attachment 1). Here, it was asked which of the tools the interviewees know and actively use in their work and if they had made positive or negative experience with them. This quantitative data is supplemented by the qualitative evaluation of these positive or negative remarks. The background of this section is to analyze the current situation of the usage of business model development tools. Subsequently, this information can be used to align the shaping of the stages of the stage gate process with elements that already work within the company´s environment.

Table 4 below shows the results of the quantitative data collection. The basis of the listed tools was developed after consultation with AVL employees working in the field of business model innovation. In addition, the tool no. 18 – 'Data Service Cards' – in whose development the supervisor of this thesis was involved, was considered.

	Name of the tool	Status	By no. of interviewees
1	Business Model Canvas	tool is known	11
		tool is used	11
		negative experience	2
		positive experience	9
		tool is strongly emphasized	2
2	Value Proposition Canvas	tool is known	10
		tool is used	10
		negative experience	0
		positive experience	10
		tool is strongly emphasized	2
3	55 Business Model Patterns	tool is known	5
		tool is used	3
		negative experience	0
		positive experience	3
		tool is strongly emphasized	3
4	Scenario Technique	tool is known	6
		tool is used	5
		negative experience	1
		positive experience	4
		tool is strongly emphasized	1
5	Data Map	tool is known	2
		tool is used	2
		negative experience	0
		positive experience	2
		tool is strongly emphasized	0
6	Data Product Canvas	tool is known	1
		tool is used	1
		negative experience	0
		positive experience	1
		tool is strongly emphasized	0
7	User Stories	tool is known	11
		tool is used	9
		negative experience	0
		positive experience	9
		tool is strongly emphasized	2
8	Customer Persona	tool is known	11
		tool is used	9
		negative experience	2
		positive experience	7
		tool is strongly emphasized	2
9	SWOT	tool is known	11
		tool is used	11
		negative experience	2
		positive experience	9
		tool is strongly emphasized	2

	Name of the tool	Status	By no. of interviewees
10	PESTEL	tool is known	11
		tool is used	10
		negative experience	4
		positive experience	6
		tool is strongly emphasized	0
11	Porter´s 5 Forces	tool is known	11
		tool is used	11
		negative experience	4
		positive experience	7
		tool is strongly emphasized	1
12	Stakeholder Analysisi	tool is known	11
		tool is used	9
		negative experience	0
		positive experience	9
		tool is strongly emphasized	3
13	ROI	tool is known	11
		tool is used	10
		negative experience	0
		positive experience	10
		tool is strongly emphasized	2
14	Business Roadmap	tool is known	8
		tool is used	8
		negative experience	1
		positive experience	7
		tool is strongly emphasized	0
15	Customer Surveys	tool is known	9
		tool is used	9
		negative experience	0
		positive experience	9
		tool is strongly emphasized	5
16	Business Model Risk Matrix	tool is known	0
		tool is used	0
		negative experience	
		positive experience	
		tool is strongly emphasized	
17	Digital Value Creation Framework	tool is known	0
		tool is used	0
		negative experience	
		positive experience	
		tool is strongly emphasized	
18	Data Service Cards	tool is known	0
		tool is used	0
		negative experience	
		positive experience	
		tool is strongly emphasized	

Table 4 Current situation of business model development tools at AVL

One can see that there are eight tools (BMC, User Stories, Customer Persona, SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats), PESTEL analysis (Political, Economic, Social, Technological, Environmental and Legal), Porter´s 5 Forces, Return of Investment Calculation ROI, Stakeholder Analysis), which are known by all eleven interviewees. Moreover, three of them (Business model canvas, SWOT, Porter´s 5) are actively being used by all interview partners. When it comes to evaluating the tool's popularity, five tools received a 100 % approval, which means that the experts have had positive experiences with it. These are the ROI calculation, Customer Surveys, User Stories, Value Proposition Canvas and Stakeholder Analysis. For the sake of completeness, one shall mention the 100 % approval for the Data Product Canvas and the 55 BM patterns cards. However, since they are only used by one respectively three interviewees, these results are less meaningful. The most popular tool is the tool of Customer Surveys: In addition to nine out of nine positive experiences, a majority of five out of nine experts strongly emphasized the importance of this tool. This outcome corresponds well with how the interviewees highlight the element of 'customer proximity' in their BMI approach.

In the following paragraphs these quantitative aspects are now supplemented with qualitative statements by the interviewees.

A central topic, mentioned by the interviewees, is the correct handling of the tools. According to four interviewees the benefit of the tools greatly depends on the right usage. Further, the most commonly made mistake is that users simply fill out the tool´s templates without giving it a second thought. In this regard Expert 2 similarly to other interviewees said:

> 'All tools serve to question oneself and not just to be filled. Cross-references between the individual tools must be found. Do not make a doctoral thesis out of the tools.'

Another repeatedly mentioned theme is the large, company-wide spread of the tools by Osterwalder and Pigneur. The Business Model Canvas and the Value Proposition Canvas are used throughout the whole company. Thus, these tools serve as a means of communication as Expert 1 stated:

> 'You can pick up all of them very well in a group, and everyone thinks about the important points of a business model. It's also good that the BMC is now so established that everyone understands what it means.'

Furthermore, four interviewees (Expert 2, Expert 1 Expert 3, Expert 6) remarked that they use business model development tools iteratively, especially the Business Model Canvas. Expert 2 in this regard mentioned that '*the BMC needs to be a living object*' and Expert 3 further elaborates: '*The BMC accompanies me through the entire development process, [it] has an iterative character'*. This described handling corresponds well with the previously analyzed general approach in business model innovation, as the business model itself is developed in iterations.

Summary: Evaluation of business model development tools

It was found out that the Business Model Canvas and the Value Proposition Canvas serve as a means of communication and information sharing within AVL due to their popularity. Further, it was discussed how different tools are to be utilized in the correct way. Lastly, it was emphasized to use the development tools iteratively, as the business model itself is also innovated in iterations.

5.2.2 What Examples of Best Practices and Lessons Learned in the field of BMI are there?

The lessons learned and best practices once more highlight the importance of a proper customer needs assessment. Further, customer feedback is to be obtained as early as possible. Moreover, BMI is at its best when it is driven by an interdisciplinary team. Lastly, the importance of internal networks, as well as the reutilization of existing elements are emphasized.

Recurring themes

• Conduction of a need assessment
• Early customer feedback
• Making use of interdisciplinarity in BMI
• Gather commitment from superiors by using networks in which ideas are promoted
• Reutilization of elements that already exist within AVL

On the one hand, the next part of the interview dealt with the lessons learned, which the interviewees had been taught in their work concerning business model innovation; and on the other hand, it covered the best practices they have derived from them.

In this regard, all eleven interviewees stated that the most important thing is the precisely conducted conduction of a needs assessment analysis. In various wordings but consistent in their point, the interviewees explained that this is crucial for successful BMI. Moreover, the non-precisely conducted needs assessment analysis is the most common and costly mistake made in early project phases, the experts remark. Expert 1 summarized this as follows.

> ‘The most important thing is always to build a solution for something where there really is a problem, building solutions for things where the customer or the market has no problem is fundamentally wrong. In other words, the most important thing is– that’s what startups write everywhere at

> conferences 'We love problems'. If I have found a problem in the world, I can solve it and build a business model around this solution.'

Expert 6 taking the same line stated: '*Nothing works without a precisely defined actual problem. Many developments miss the market because of a lack of good market and customer analysis*'. Expert 2 further elaborated that: '*Only because something is a breaking technological innovation, it does not have to be successful on the market'*. Expert 3 finally concludes: '*You need customers and all considerations I make when the customer is not yet known or even exists can be worthless*.'

Furthermore, another lesson learned, which was mentioned by five interviewees, is the element of early customer feedback. This is following similar motives as the needs assessment analysis. At this point of the business model innovation, however, an MVP already exists. Subsequently, as highlighted by the experts, it is essential to approach potential customers and to collect feedback right after an MVP has been built. This is what Expert 9 stated:

> 'Get customer feedback early on. With digital innovations, you have to create an MVP and start testing from about 50 percent maturity. Before that, the substance for validation is missing. MVP approaches are much more important in a data-driven environment.'

The next example of a best practice within the course of business model innovation is the utilization of interdisciplinarity. Three interviewees emphasized the importance of collaboration in interdisciplinary teams. Expert 4 remarked:

> 'In addition, I have made the experience that business model development should not only be driven by technicians but also by people with an economic background. There must be a good balance. Complementary skillset is the keyword.'

Another lesson learned of the experts is what they call agility, to not get stuck on a draft of a business model or parts of it. As Expert 2 explained, this agility and flexibility is enabled by a well-established error culture. He further elaborated:

> 'The First draft of the business model is not equal to the final solution. It is also important that there is no shame in allowing oneself to make a mistake. After all, you learn from it. The only important thing is not to invest too many resources in this misstep.'

Expert 3 added:

> 'What you think at the beginning, how it runs is a huge difference to how it really runs, that's why 'agile' is a very important word, agile thinking and considering the affordable loss.'

Expert 9 added another interesting point which is: '*Iteration must not stop when the product is on the market. Living business model. Think of criteria and KPI and then readjust them.*'

Lastly, the interviewees mentioned lessons learned that have already been discussed in previous chapters of the result evaluation. The alignment with the corporate strategy, the reutilization of already existing elements and the importance of internal networking are all quoted as important lessons learned.

Summary: What examples of best practices and lessons learned are there?

All interviewees agreed on the importance of a precise conduction of a needs assessment analysis and declare this as a major lesson learned. This is to be done in initial phases of the business model innovation. Subsequently and following the same motives, five experts highlighted the importance of customer feedback and the well-considered timing of when to inquire it. Further, three interviewees emphasized the relevance of interdisciplinary teams within BMI.

5.2.3 What Requirements do Employees place on a Process?

According to the interviewees, a process must be simple to understand and to use. With a strong focus on the target, it shall educate the user. Furthermore, the psyche of the user during the process is discussed. Lastly, a process should produce clear deliverables.

Recurring themes

• Simplicity of a process
• Target focus within a process
• Education for and within a process
• Psychological aspects of using a process
• Featuring clear deliverables

The last part of the interview evaluated what requirements the experts place on a process to make them as user friendly and as likely to be used as possible. Here, the focus lay on the characteristics of a process itself and not on the underlying topic of business model innovation.

The most obvious requirement on a process, quoted by all experts, is simplicity. If the process is not easy to use it generates a certain aversion to it. Apart from this finding, it was the aim to collect more implicit requirements that are valuable for the adaptation and the presentation of the stage gate process.

Firstly, four interviewees mentioned that the overall goal of the process should be in the foreground and not the process itself or its execution. Accordingly, it often happens that the process applicant loses sight

of the actual goal and ends up getting lost in the smallest process steps. Concerning this, Expert 4 explained:

> 'We, but probably other companies as well, tend to see processes that make sense and support the activities of the relevant stakeholders as being completely influenced by a tool that has been put on top of them, so that the tool is in the foreground and the administrative facet and feeding of any tool with data, and not the process and the meaning behind it.'

Expert 2 added: '*The process should not be too strict; it should fit into the 'lean concept'. 'Anchor points' are important in a process for orientation'.*

Another aspect the interviewees mentioned is that the process applicant shall have the appropriate education to correctly use the process. Moreover, the process ought to be educating, as the usage of a process fosters its immanent way of thinking. Three experts emphasized the educating character of a process. Expert 1 in this regard stated:

> 'It must be simple in order to make a department accessible for a new topic. Everyone should have the know-how to apply the process correctly, otherwise it will be frustrating. A process can help if you are planning to establish the inherent mindset in the process anyhow.'

Furthermore, three interviewees remarked that it is beneficial to a process if it actively supports the decision-making of the management. Expert 9 remarked:

> 'It must support the decision making process, it must give orientation, [a] clear yes/no decision − unambiguity. Provide clear statements. Resources must be released in a binding manner.'

For Expert 7 this support in the decision-making can be achieved by incorporating binding KPIs (Key Performance Indicators) into the process. Similarly, Expert 11 stated 'a process must produce clear deliverables in any form, upon which decisions can be made'.

Lastly, two experts talked about the emotions, the user feels when applying the process. Expert 8 elaborated this psychological aspect:

> 'I think '*process'* somehow has an emotional tie within. The area is what I have worked with, in AVL, there's an impression 'process means it's binding my hands − It's a pain!'. That needs to be broken in the first place. Why? Because I think maybe even sometimes, instead of calling it a process, we should we could call it a framework.'

Further, Expert 5 added: '*The process must be fun in part. I have to encourage teamwork and creativity tools help in doing so*'. Similar to that Expert 10 stated that '*The sensation of teamwork is especially helpful for young graduates and employees.*'

Summary: What requirements do employees place on a process?

All experts mentioned that a process needs to be simple and easy to use. A further important topic is the emphasis of the overall goal of the process compared to its mere execution. Additionally, the applicants of the process shall have the appropriate education to correctly apply the process. Moreover, the process ought to be educational to its applicants. The implementation of KPIs into the process was discussed, as this supports the management's decision-making. Lastly, two experts say that the design of the process should consider how its applicants feel when applying it.

6 Adaptation of the stage gate process

The following chapter deals with the adaptation of the stage gate process. First, the design requirements will be derived and described. Subsequently, based on these requirements the stages and gates of the process will be adapted. Hence, this chapter deals with the achievements of the content goals of the objective hierarchy (see Figure 12 Objective hierarchy).

Once more a problem-solving cycle is applied to reach the objective of the process adaptation. This represents a smaller problem-solving cycle to accomplish an individual step of the greater problem-solving cycle to reach the overall objective of this master thesis. Figure 14 below illustrates this smaller problem-solving cycle and the corresponding steps. Subsequently, the following paragraphs will explain it.

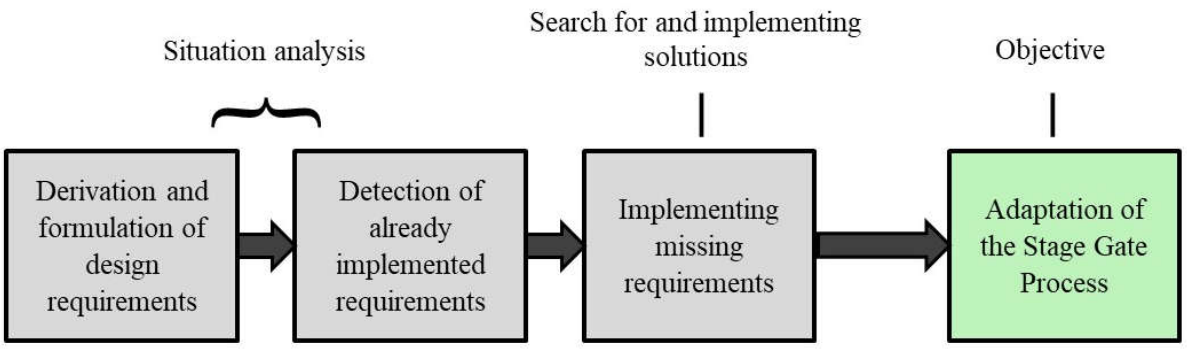


Figure 14 Procedure of the adaptation of the stage gate process (own illustration)

Firstly, design requirements for the stage gate process are formulated. This is done based on the interview results analysis. The design requirements determine how the stage gate process shall be shaped. They specify the thematic points and how the stage gate process is procedurally structured. After setting the requirements the original stage gate process is to be analyzed once more. It is examined whether and how the design requirements are already included in the original version of the stage gate process. Subsequently, ways to implement the missing requirements are elaborated. Thus, the goal of adapting the process to AVL needs is reached.

6.1 Derivation and formulation of Design Requirements

The interview series investigated how BMI is carried out at AVL. As described in 5.1.5, the interviewee´s statements were labelled with headlines. The occurrence of each headline is counted if the corresponding content of the statement thematized aspects that contribute to successful BMI. This

corresponds with a frequency analysis as outlined by (Mayring, 2015, p. 13 ff.). Within this frequency analysis it is possible that one interviewee can mention a topic multiple time. Table 5 below shows the headlines and their number of occurrences.

No.	Headline	Number of occurrences
1	Following the lean start up approach a.) Maintaining customer proximity b.) Formulating and testing hypotheses c.) Iterating the business model innovation d.) Creation of an MVP	25
2	Conduction of a need assessment analysis	14
3	Education for and within a process	12
4	Market analysis	9
5	Alignment with corporate strategy	8
6	Wide spread of the tools BMC & VPC	8
7	Simplicity of a process	6
8	Featuring clear deliverables	6
9	Reutilization of elements that already exist within AVL	5
10	Gather commitment from superiors by using networks in which ideas are promoted	5
11	Making use of interdisciplinarity in BMI	4
12	Decision-making conducted like in the lion´s den in which the VPs form the committee	4
13	Psychological aspects of using a process	4

Table 5: Headlines and number of occurrences

Since the importance of these headlines and their corresponding content is emphasized by the various experts, it was agreed that they shall serve as design requirements for the stage gate process. The design requirements form the basis for the adaptation of the process. It is intended to fulfill every design requirement to match AVL´s needs. To ease the integration of each requirement, they are divided into three categories: This division is made due to the different focusses of the requirements and the varying ways of applying and integrating them. Some refer to thematic aspects, others to aspects of the process characteristics. Finally, the requirements also contain best practices. In this regard Dick et al. (2017, p. 8) list different kinds of requirements, on which this division is based. Hence, the division is as follows:

- **Thematic focus:** These are the requirements which influence **what** is done within the stage gate process. They determine the content of the actions taken. With respect to the listing of Dick et al. (2017), these requirements correspond to functional requirements.

- **Process characteristics:** These are the requirements which influence **how** things are done within the stage gate process. They determine the structure and the framework conditions of the stage gate process. With respect to the listing of (Dick et al. 2017), these requirements correspond to operational requirements.
- **Best practices:** These are the requirements which influence the **quality** of the actions taken. They are not binding requests for action; they are merely tips and tricks that make the work easier and improve the results. With respect to the listing of (Dick et al. 2017), these requirements correspond to non-functional requirements.

Table 6 below shows the allocation of the design requirements into the three categories.

No.	Design requirement	Category
1	Following the lean start up approach a.) Maintaining customer proximity b.) Formulating and testing hypotheses c.) Iterating the business model innovation d.) Creation of an MVP	Thematic focus
2	Conduction of a need assessment analysis	Thematic focus
3	Education for and within a process	Process characteristics
4	Market analysis	Thematic focus
5	Alignment with corporate strategy	Thematic focus
6	Wide spread of the tools BMC & VPC	Process characteristics
7	Simplicity of a process	Process characteristics
8	Featuring clear deliverables	Process characteristics
9	Reutilization of elements that already exist within AVL	Thematic focus
10	Gather commitment from superiors by using networks in which ideas are promoted	Best practice
11	Making use of interdisciplinarity in BMI	Best practice
12	Decision-making conducted like in the lion´s den in which the VPs form the committee	Process characteristics
13	Psychological aspects of using a process	Process characteristics

Table 6: The three categories of design requirements

In the following each design requirement is discussed and requirement statements are formulated. It is described why it is considered a design requirement and which benefits it provides within the application of the stage gate process. These considerations are based on the interview results and supplemented with literature research. Moreover, these requirements are formulated respecting the ‘Guide to writing requirements’ by (International Council on Systems Engineering (INCOSE), 2012).

Design Requirement 1.) Following the Lean Startup Approach

Since nine out of eleven interview experts apply and recommend the Lean startup approach or at least elements of it for the purpose of BMI, this is considered a major design requirement of the stage gate process. This design requirement comprises four sub points which correspond to the Lean startup approach described in 2.4.1.

a.) Maintaining customer proximity: Here, it is aimed for good and close communication with the customer over the entire life cycle of the offering. According to (Fehmel, 2009, p. 4) this ensures high quality of the offering and longer customer retention. Moreover, Peters and Waterman (2004, p. 156) identify customer proximity as a business success factor in their empirical study. The stage gate process should provide guidance how to interact with the customer. Further, it should guide the applicant on when and how customer feedback should be obtained. This should be done early, but not too early, because otherwise the substance for validation is missing (Expert 9). Possible ways to obtain customer feedback are MVPs, customer interviews, questionnaires, field studies or similar.

b.) Formulating and testing hypotheses: This concept is to be implemented in the stage gate process, as the interview series shows that it is already anchored in startup like departments of AVL. Expert 1 highlights its importance by stating: '*Formulating and testing hypotheses costs little, that's why it is so popular with Start-ups.*'

c.) Iterating the business model innovation: As the stage gate process shall reflect what successfully works at AVL, elements of iterative characteristics must be implemented. Further, this refers to the Build-Measure-Learn Cycle (described in Section 2.4.1.2) which enables validated learning.

d.) Creation of an MVP: The MVP concept (described in Section 2.4.1.3) is widespread at AVL (see interview results). 'Its goal is to test fundamental business hypotheses' (Ries, 2011, p. 97). Therefore, the stage gate process shall guide its applicants in the creation of an MVP.

Design Requirement 2.) Conduction of a Needs Assessment Analysis

The subject of a precisely conducted needs assessment analysis is strongly emphasized in the interview series. According to expert 1 and 5 some projects fail, because they provide solutions for areas, where there is no sufficient customer need. Further, the needs assessment analysis supports subsequent decisions about the offering´s design, implementation, and pricing. This ultimately helps to achieve desired results (Watkins, West Meiers, & Visser, 2012, p. 5).Hence, this aspect is to be firmly highlighted in the stage gate process.

Design Requirement 3.) Education for and within a Process

The interviewed experts made clear, that before one starts to apply a process it must be specified which skills and education the applicant needs to bring. Moreover, the application of a process holds the potential of educating its applicant. Therefore, the design of the stage gate process shall emphasize the sense of each given step. This should help the applicant to internalize the lessons of the process. Further, the applicant shall be educated on the utilization of the featured business model development tools. According to the experts, business model development tools such as the BMC, VPC, SWOT analysis are often used wrongly. Consequently, they lose a lot in value. The stage gate process shall, therefore, ensure the correct handling of the tools. This can be achieved by providing tips, tricks, and examples of best practices.

Design Requirement 4.) Market Analysis

Equally to the needs assessment analysis, the market analysis supports the decision making within a business. The current state of the market and the development are examined. Based on this, a prognosis for the future is made, which supports the decision making. The market analysis covers various aspects. Among them are: the sales market, the procurement market, the financial market, the job market, competitors and potential sales channels. (Kompakt-Lexikon Wirtschaft, 2014, p. 368) Concluding, the stage gate process shall guide its applicant through the market analysis

Design Requirement 5.) Alignment with Corporate Strategy

As the statements of Experts 4, 6 & 9 underline, resources are primarily allocated to projects fitting the corporate strategy of AVL. The corporate strategy aims to reach a ‘unique and valuable position’ on the market; this is achieved by focusing on what to do and especially what not to do (Porter, 1996). In accordance to that, AVL has established the IFAs (Innovation Focus Areas). This is a funding pool dedicated to foster the corporate strategy. Hence, the stage gate process needs to include elements that serve the strategy alignment within AVL.

Design Requirement 6.) Wide Spread of the tools BMC & VPC

The interview series show that the tools BMC & VPC are widely used within AVL. The BMC is used by all interview partners and ten out of eleven use the VPC in their approach to BMI. Expert 1 states that these tools are well suited as a means of communication due to their wide spread. To emphasize aspects that already work within AVL the tools BMC and VPC shall play a special role in the stage gate process.

Design Requirement 7.) Simplicity of a Process

All interview partners explicitly outlined simplicity as a major design requirement for the stage gate process. Hence, the administrative facets within the application of the stage gate process are to be reduced to a necessary minimum (Expert 2). To enhance its simplicity the stage gate process shall only feature actions that contribute to a clearly marked goal. Consequently, a good balance between the process´ simplicity and the provision of sufficient guidance must be found within the adaptation of the stage gate process.

Design Requirement 8.) Featuring clear Deliverables

Since the gates contain clear assessment criteria, there should also be clear deliverables based on which one can assess the progress. Further, clear deliverables shall ease and standardize the decision-making progress. Thereby, a comparison between two business model innovations going through the stage gate process is made possible as well. Lastly, clear deliverables provide orientation for the applicant of the process.

Design Requirement 9.) Reutilization of Elements that already exist within AVL

As shown in chapter 2.2, BMI is not about reinventing everything from scratch, but it can be achieved by the recombination of already existing elements. Therefore, the stage gate process shall provide the means to detect and subsequently recombine suitable elements. Another advantage of the recombination of existing elements is that they are already by nature aligned with the corporate strategy.

Design Requirement 10.) Gather Commitment from Superiors by using Networks in which Ideas are promoted

'*Networking is a methodical and systematic way of maintaining relationships with the open intention of mutual support, exchange and personal benefit*' (Scheler, 2000, p. 22). In this respect, Expert 6 emphasizes that it is important that everyone feels valued for their work. In turn, this increases the chances of a decision in one´s favor. Hence, the stage gate process shall indicate the importance of creating and maintaining networks within the company.

Design Requirement 11.) Making use of Interdisciplinary in BMI

The interviewed experts agree that it takes interdisciplinarity to drive successful BMI. A good balance between people with various educational backgrounds shall be targeted. Therefore, elements that foster cross-sectoral collaboration like interdisciplinary workshops are to be included in the stage gate process.

Design Requirement 12.) Decision-making conducted like in the Lion´s Den in which the VPs form the Committee

The decision of resource allocation is conducted like in the 'lion`s den', the popular TV-show, within several investigated departments. In the case of AVL, the management forms a committee in front of which the business ideas are pitched. Thereupon, decisions are made, and resources are distributed. The stage gate process shall draw attention to this company internal characteristic and prepare the process applicant for this event in the best possible way.

Design Requirement 13.) Psychological Aspects of using a Process

Three experts (4, 8 & 10) mention the importance of the psyche of the person applying the stage gate process. According to them, the performance is improved when the psyche is taken into account in any working environment. The implementation of team spirit within a process, creative and joyful activities, and the semantic characteristics of words and terms were discussed within the interview series. The stage gate process shall consider these aspects and the well-being of its applicant.

6.2 Detection of already implemented Design Requirements

AVL´s design requirements for the stage gate process have been identified within the interview series and are summarized in Table 5 above. Next, the original version of the stage gate process is analyzed again. This time it is investigated which of the identified design requirements of Table 5 are already included in the stage gate process. Therefore, all elements of the process – depictions, gate criteria, formulations, bullet points, graphics etc. – are examined to see if they address and meet the respective design requirements. Thus, a requirement evaluation is conducted.

Heßeler et al. (2004, p. 55) state that a requirement evaluation can have three results

- Requirement is met
- Requirement is not met
- Requirement is met under reserved changes

This classification is applied to the investigation of the original stage gate process. Accordingly, three possible results of this investigation are formulated as following:

- The design requirement is already included in the stage gate process
- The design requirement is missing in the stage gate process
- The design requirement is implicit or insufficiently highlighted

A design requirement is classified as ‘implicit or insufficiently highlighted’ under the following conditions: In some cases, it is not possible to clearly determine whether the requirement is addressed or not. This can be because a process element only addresses the requirement in passing, for example in a subordinate clause. Further, the process element does not address the requirement directly, but implicitly, for example by paraphrasing the actual design requirement. Another reason is that the requirement was considered in the original version, but it has not been sufficiently put into practice. In all cases changes must be made to sufficiently meet the regarding requirement. That is why it corresponds to the category of ‘Requirement is met under reserved changes’.

Figure 15 and Figure 16 below give two examples of how the original version of the stage gate process has been examined and how the design requirements have been identified. Figure 15 shows how an ‘already included’ design requirement i.e. ‘alignment with corporate strategy’ is identified. Figure 16 exemplifies the identification of a design requirement which is ‘implicit or insufficiently highlighted’.

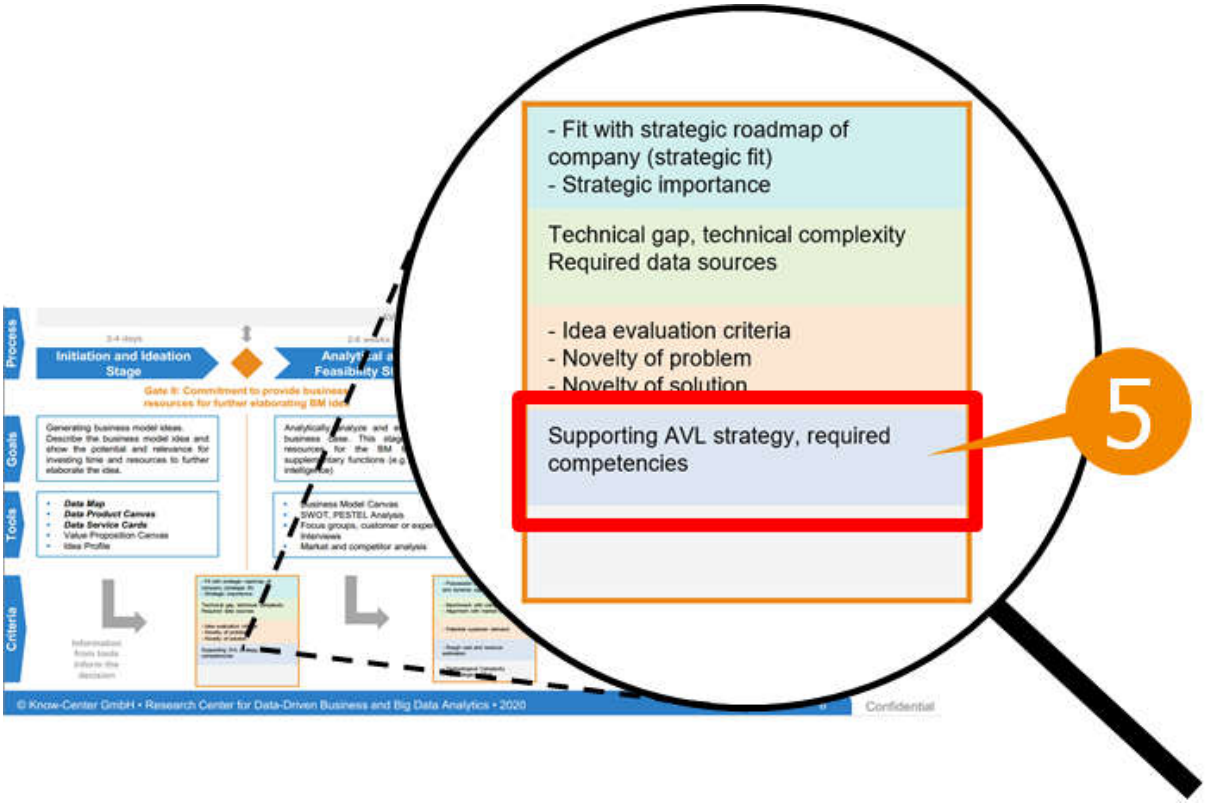
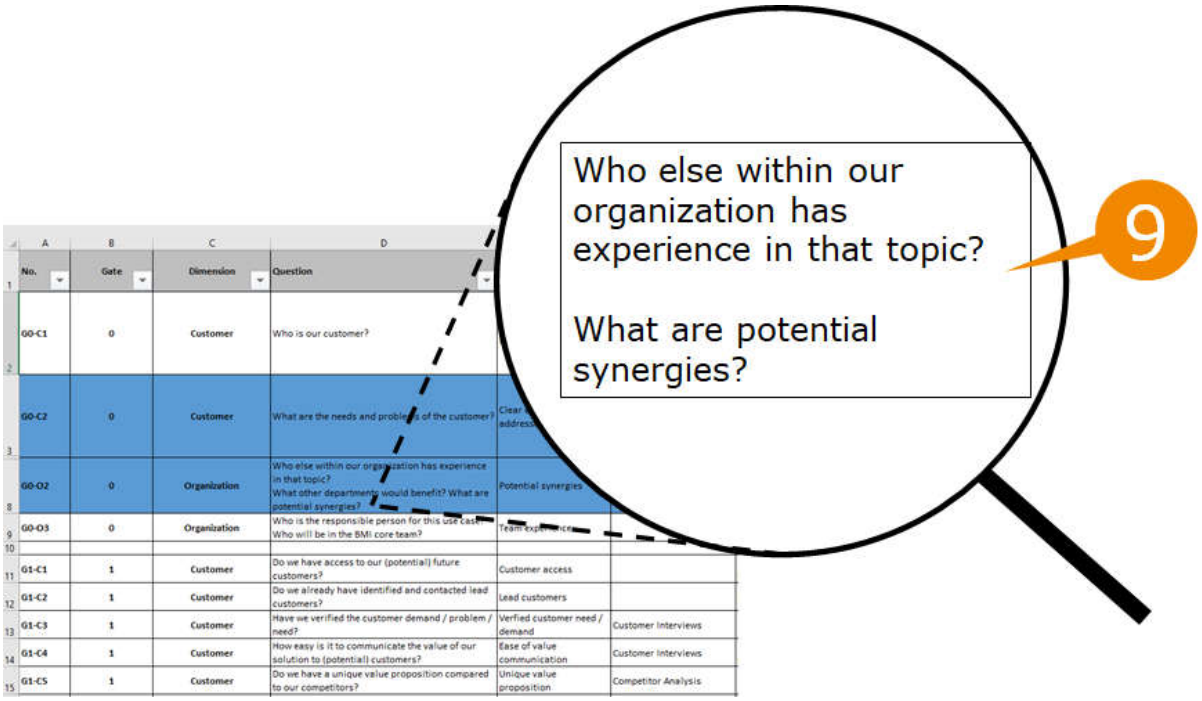


Figure 15 Identification of an already included design requirement

Here, the design requirement no. 5 ‘Alignment with the corporate strategy’ is clearly identified in the general depiction of the stage gate process.



No.	Gate	Dimension	Question		
G0-C1	0	Customer	Who is our customer?		
G0-C2	0	Customer	What are the needs and problems of the customer?	Clear problem addressed	
G0-O2	0	Organization	Who else within our organization has experience in that topic? What other departments would benefit? What are potential synergies?	Potential synergies	
G0-O3	0	Organization	Who is the responsible person for this use case? Who will be in the BMI core team?	Team experience	
G1-C1	1	Customer	Do we have access to our (potential) future customers?	Customer access	
G1-C2	1	Customer	Do we already have identified and contacted lead customers?	Lead customers	
G1-C3	1	Customer	Have we verified the customer demand / problem / need?	Verfied customer need / demand	Customer Interviews
G1-C4	1	Customer	How easy is it to communicate the value of our solution to (potential) customers?	Ease of value communication	Customer Interviews
G1-C5	1	Customer	Do we have a unique value proposition compared to our competitors?	Unique value proposition	Competitor Analysis

Figure 16 Identification of an 'implicit or insufficiently highlighted' design requirement.

In Figure 16 the gate criteria for gate 0 asks the question 'Who else within our organization has experience in that topic'. This implies what is expressed by design requirement no. 9 'Reutilization of elements that already exist within AVL'.

The entire investigation, including how each design requirement is searched for, can be seen in Attachment 3. The result of the investigation is shown in

Table 7 below. It shows if the corresponding design requirement is already included, implicitly included, or missing. In addition, the "Solution" column shows which measures are taken to implement these requirements into the stage gate process. These measures will be explained in more detail in the next section 6.3.

No.	Design Requirement	Status	Solution
1	Following the lean start up approach		
	a.) Maintaining customer proximity	Already included	
	b.) Formulating and testing hypotheses	Implicitly included	Guidance on hypotheses formulation
	c.) Iterating the business model innovation	Implicitly included	Emphasis on feedback loops
	d.) Creation of an MVP	Already included	
2	Conduction of a need assessment analysis	Already included	
3	Education for and within a process	Implicitly included	The playbook
4	Market analysis	Already included	
5	Alignment with corporate strategy	Already included	
6	Wide spread of the tools BMC & VPC	Already included	
7	Simplicity of a process	Implicitly included	The playbook
8	Featuring clear deliverables	Implicitly included	Introduction of final tools
9	Reutilization of elements that already exist within AVL	Implicitly included	Introduction of portfolio checks
10	Gather commitment from superiors by using networks in which ideas are promoted	Already included	
11	Making use of interdisciplinarity to drive BMI	Implicitly included	Introduction of interdisciplinary workshops
12	Decision-making conducted like in the lion´s den in which the VPs form the committee	Missing	Guidance for the preparation of a pitch
13	Psychological aspects of using a process	Missing	Introduction of motivational elements

Table 7 Result of the search for already implemented requirement

6.3 Implementation of all Design Requirements

Since the goal is to adapt the stage gate process to AVL´s needs, all their requirements must be implemented. Furthermore, all requirements must be clearly perceptible to the applicant of the stage gate process. Hence, the aspects of the 'missing' requirements must be added to the process and the 'implicit or insufficiently highlighted requirement' shall be given more focus.

As Haberfellner et al. (2019, p. 231) outline, the search for solutions requires creativity. Therefore, brainstorming workshops have been held together with AVL responsibles. Within these brainstorming workshops, solutions have been developed on how to integrate the implicit and missing design requirements into the process. These solutions have already been previewed in Table 7 above. The result of the integration of all implicit and missing design requirements is the finished stage gate process for business model innovation. Its general depiction can be seen in Figure 17 below. Figure 18 on the next page features the same depiction but it indicates and highlights all implemented solutions. For the sake of comprehensibility, the numbered brown bubbles in Figure 18 indicate at which position which solutions have been taken to meet the corresponding design requirement. Additionally, the red dots in Figure 18 indicate changes from the original version of the stage gate process that have been made to better reflect common terms and phrases used at AVL. In addition to Figure 18, the following paragraphs will provide more details on how each implicit and missing design requirement was integrated.

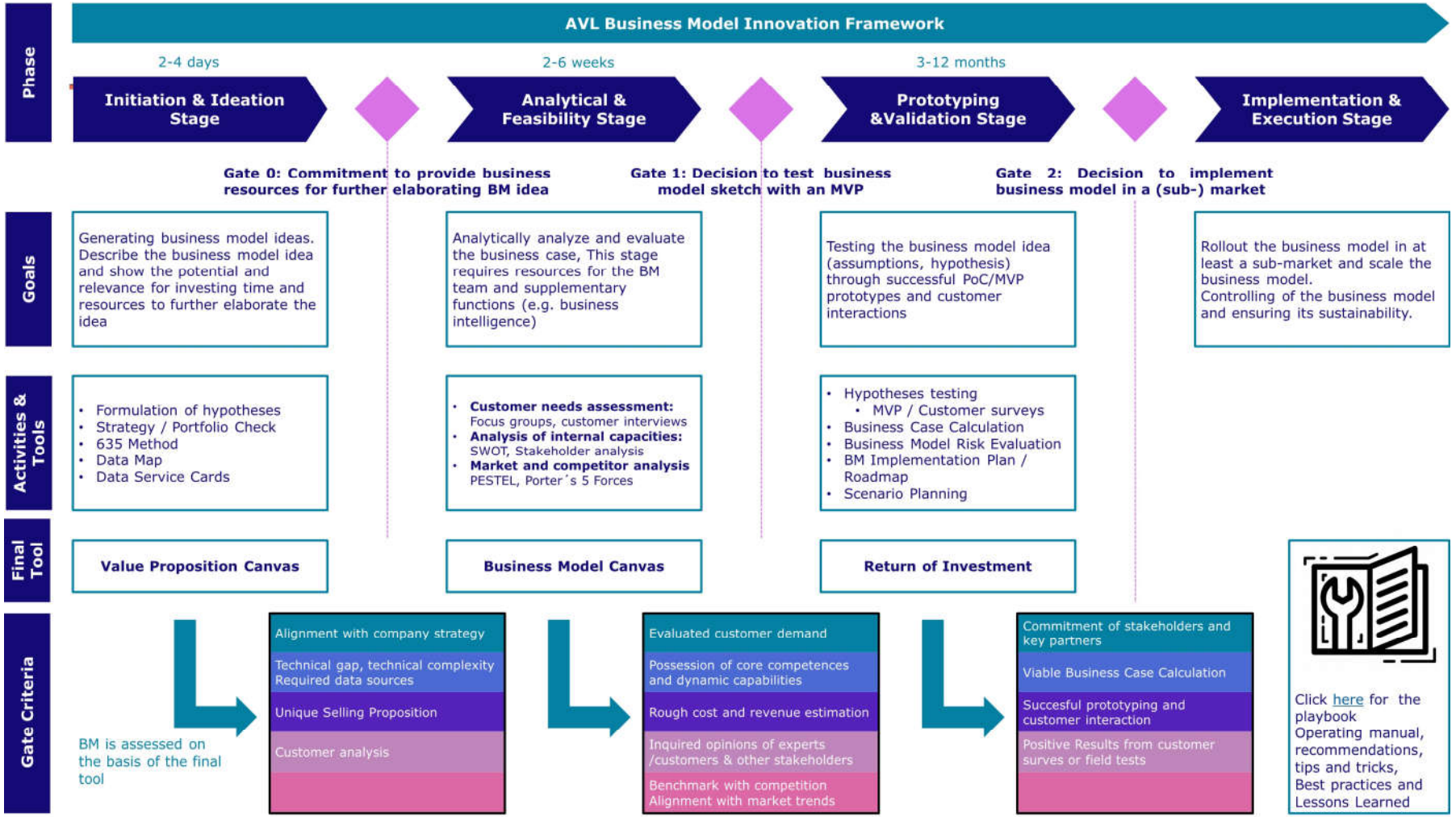


Figure 17 The stage gate process after its adaptation

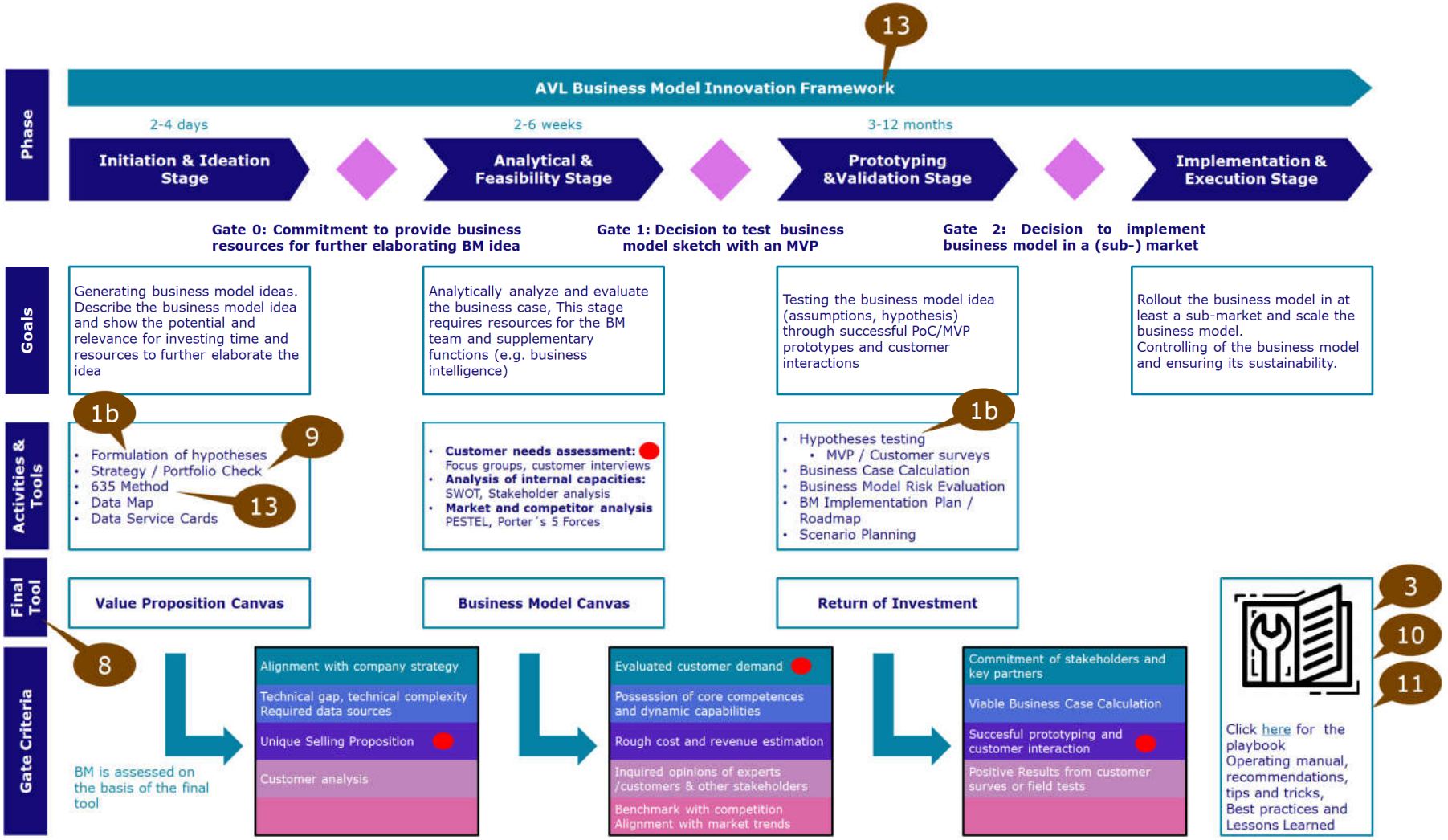


Figure 18 The stage gate process after its adaptation with indications of the implemented design requirements

The following describes the elaborated solutions on how to implement all implicit and missing design requirement. These implementations address both − the stages and the gates of the process.

Design Requirement 1.) Following the Lean Startup Approach
b.) Formulating and testing of Hypotheses

Since the formulation and testing of hypotheses is explicitly common practice in AVL, this must be reflected in the process in this precise wording. Therefore, the user is instructed to formulate hypotheses about the BM in the Initiation and Ideation stage. These hypotheses are then verified in the third phase using the MVP. This procedure is now specifically emphasized in the stage gate process. Furthermore, it is supported by the provision of useful information in the playbook. Figure 19 below shows how the design requirement 1b is integrated into the stage gate process

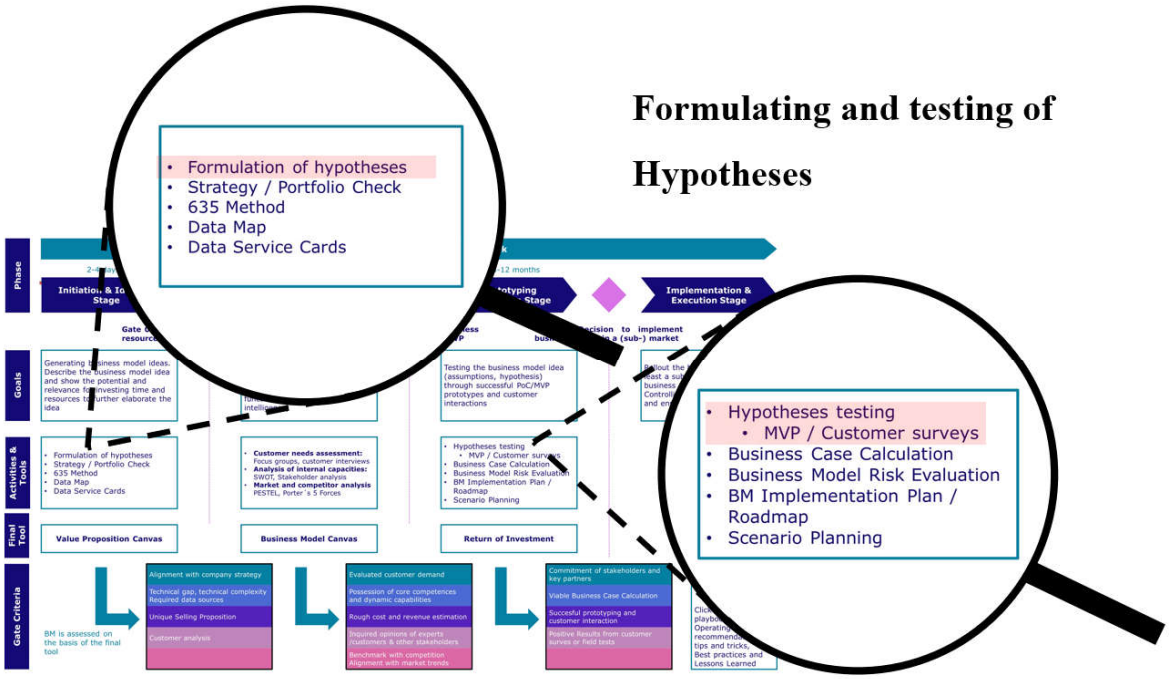


Figure 19 Implementation of the design requirement no. 1b: 'Formulating and testing of Hypotheses'

Design Requirement 1.) Following the Lean Startup Approach
c.) Iterating the BMI

To meet this design requirement and to accentuate the common practice of iterating the business model, additional process depictions are created. They can be seen in Attachment 5. These explicitly highlight

the iterative character of the stages. Further, they specify conditions under which a new iteration shall be begun.

Design Requirement 3.) Education for and within a Process

As it is the requirement to specify which education the process applicant needs for the utilization of the stage gate process, a user profile is created. This user profile represents a starting point of the playbook.

To meet the requirement of education within the process, the playbook itself is the solution at hand. It comprises the expert knowledge for BMI which has been gathered in the interview series. Further, the lessons learned by the experts are made accessible within the playbook. Moreover, the playbook will carefully guide the applicant in the handling of all provided business model development tools. It will comprise profiles of all suggested business development tools. These profiles provide the right templates and useful background information about the individual goals of each tool and how to reach them. These profiles can be seen in Attachment 6. Moreover, best practices und sample solutions will be included in the finished playbook. Figure 20 below shows how the playbook respectively design requirement no.3 is presented to the process applicant.

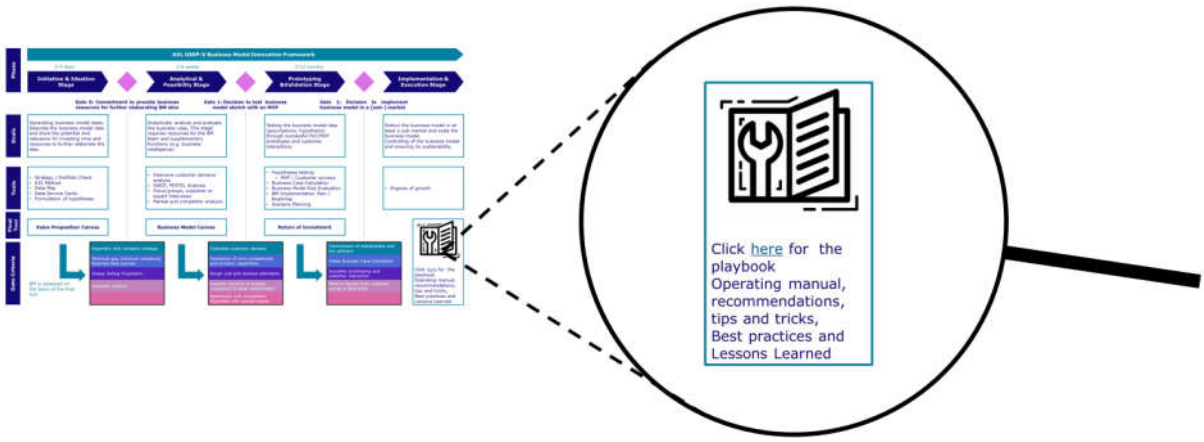


Figure 20 Implementation of the design requirement no. 3: 'Education for and within the process'

Design Requirement 7.) Simplicity of a Process

A basic simplicity of the process is given by its 'stage gate architecture'. The introduction of the 'final tool' (see Design Requirement no. 8 below) meets the requirement of simplicity and provides even more orientation. To further simplify the application of the stage gate process, depictions which provide explanations for the process application are created. They can be seen in Attachment 5. Further, the playbook and its containing information simplify the application.

Design Requirement 8.) Featuring clear Deliverables:

To meet this design requirement, ‘final tools’ are introduced to the stage gate process. These correspond to the ‘clear deliverables’ and represent the ending of a stage. With respect to the design requirement no. 6 ‘Wide spread of the tools BMC & VPC’ these were selected as ‘final tools’ for stages 0 and 1. Due to the fact that these tools cover all thematic aspects of each stage, they are well suited for this purpose. As of now, the first two stages are designed as follows: All tools except VPC and BMC are used first. The information gained from these tools contribute to the elaboration of the final tool, which in turn summarizes all relevant aspects of the previous tools. The assessing questions within the gates are also aligned with this characteristic. Hence, questions have been supplemented or reworded to directly address the respective segments of the final tool. The entire assessing questions of the gate criteria can be seen in Attachment 5. Figure 21 below illustrates the implementation of the ‘final tools’.

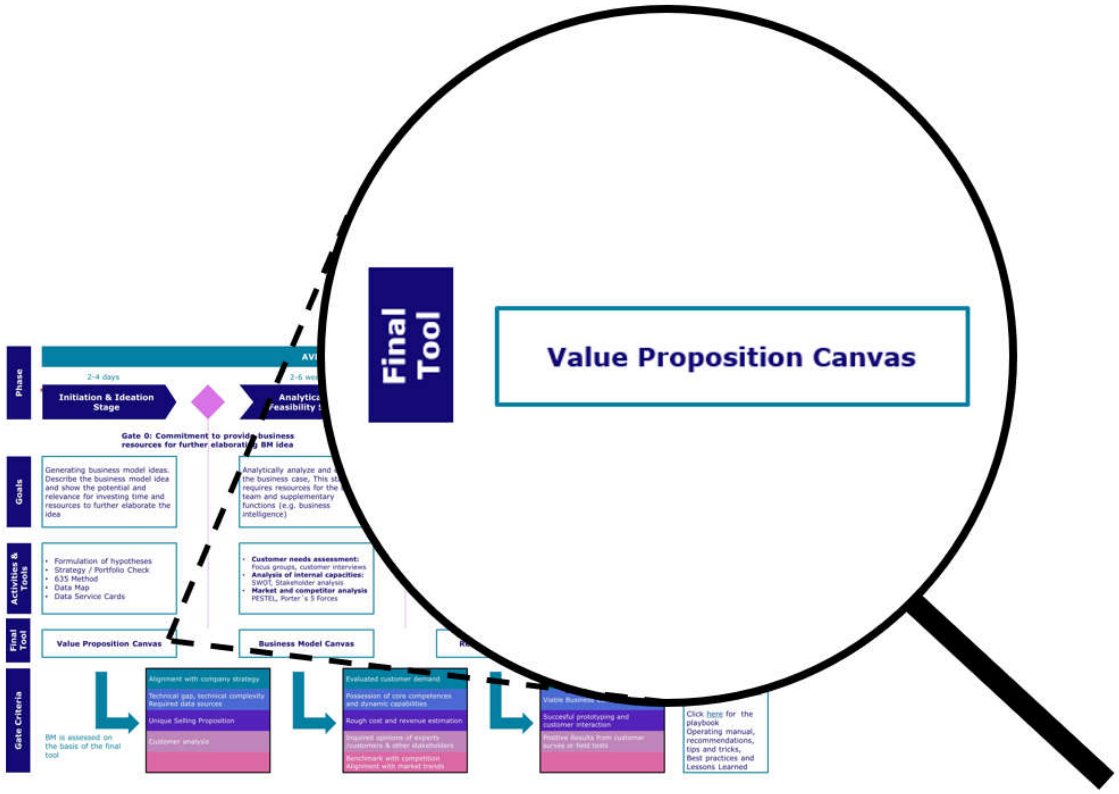


Figure 21 Implementation of the design requirement no. 8: ‘Education for and within the process’

Design Requirement 9.) Reutilization of Elements that already exist within AVL.

The process applicant is instructed to perform a portfolio check in the Initiation and Ideation stage. This enhances the familiarization of the applicant with already existing elements within AVL (products, systems, services). Thus, they are more likely to be reused in some way or another during a BMI. Furthermore, the playbook includes company internal links and contacts to adequately perform the

portfolio check. Figure 22 below shows how and at which point the process applicant is requested to perform a portfolio check.

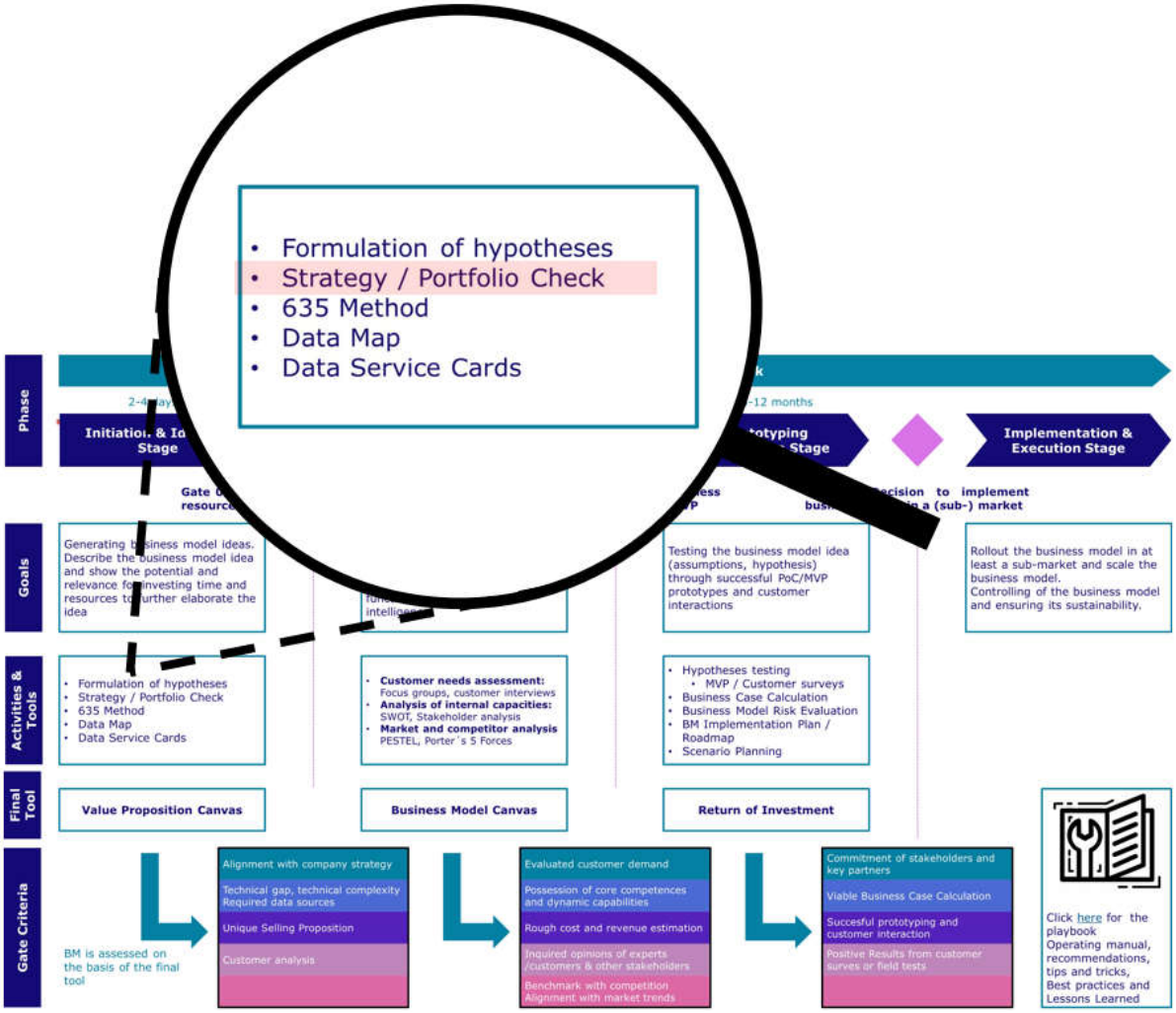


Figure 22 Implementation of the design requirement no. 9: 'Reutilization of Elements that already exist within AVL'

Design Requirement 11.) Making use of Interdisciplinary in BMI

The process applicant is instructed to organize workshop with interdisciplinary participants throughout the whole process. These workshops are comprised within the stage activities. During these workshops the recommended business model development tools are used. The profiles of these business model development tools are part of the playbook and are shown in Attachment 6. Furthermore, these profiles advise the process applicant to use these tools in interdisciplinary teams. Moreover, the playbook will

often point out the importance of a good balance between technical and business-related considerations.

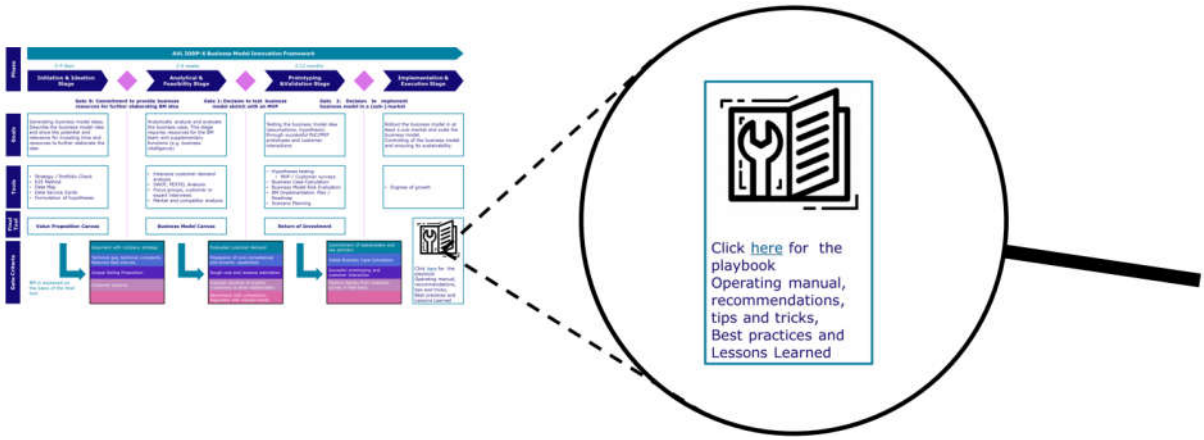


Figure *23* below shows how the playbook respectively design requirement no.9 is presented to the process applicant.

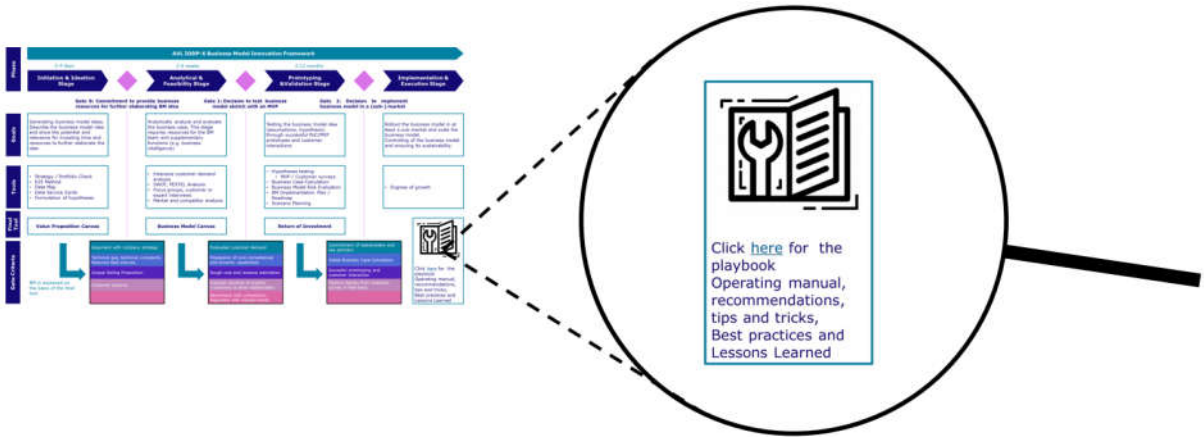


Figure 23 Implementation of the design requirement no. 9: 'Making use of Interdisciplinarity in BMI'

Design Requirement 12.) Decision-making conducted like in the Lion´s Den in which the VPs form the Committee

This company internal characteristic is also aligned with the stage gate process. At the end of stage 1 the applicant is instructed to pitch the elaborated business model in front of the management. In accordance to the introduction of 'final tools', this involves the presentation of the final tool Business Model Canvas. This procedure is now reflected in the process depictions. Furthermore, the playbook provides the user with tips, tricks, and best practices on how to best perform the pitch.

Design Requirement 13.) Psychological Aspects of using a Process

To fulfill the design ‘Psychological aspects of using a process’ two measures are taken:

- The stage gate process now features more creativity methods (e. g. 635 method) that contribute to the enjoyment of the applicant´s work. For the same reason these methods shall be applied in interactive workshops.
- The stage gate process is now renamed to ‘AVL Business Model Innovation FRAMEWORK’. This is done due to the statement of expert 8: ‘Process somehow has an emotional tie within. (…) In AVL there is an impression: ‘process’ means it´s binding my hands’. Therefore, the word ‘process’ is substituted by the word ‘framework’ in all process related belongings. (For the sake of consistency and clarity it is still referred to as ‘stage gate process’ within this master thesis.)

Figure 24 below shows how and at which points the design requirement no. 13 has been integrated.

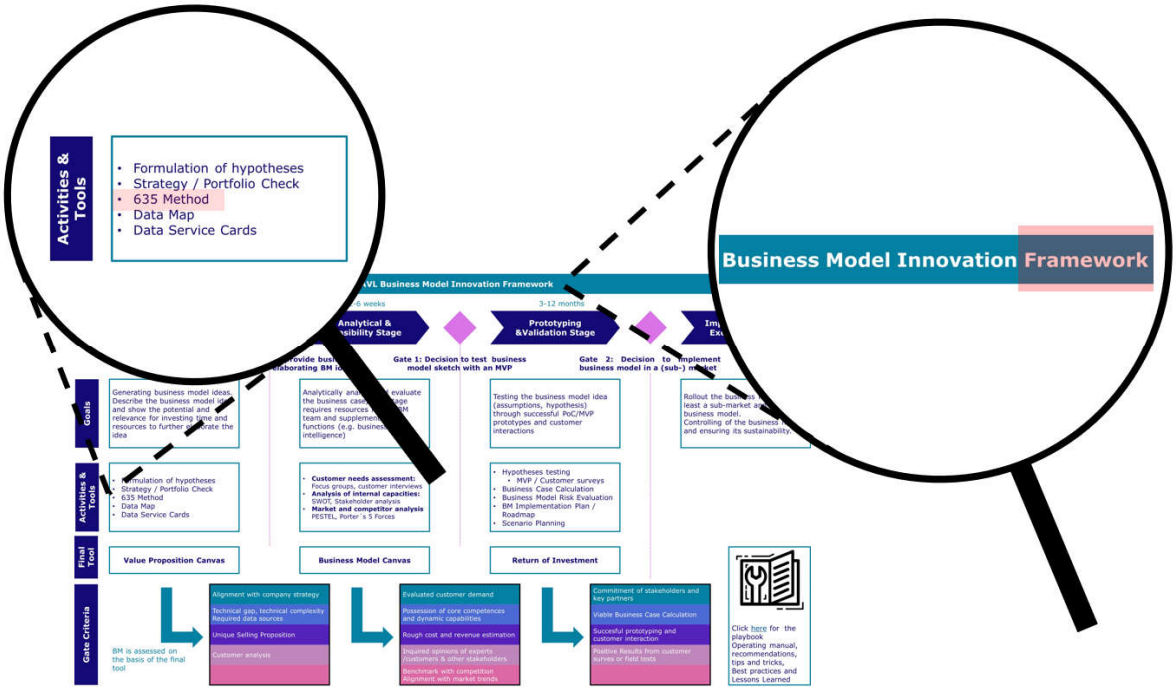


Figure 24 Implementation of the design requirement no. 13: ‘Psychological aspects of using the process’

Summary of the Implementation of all Design Requirements:

The paragraphs above described how the implicit and missing design requirements have been integrated into the stage gate process. The result is the finished stage gate process for business model innovation which has been adapted according to the requirements of AVL. The adapted version of the stage gate process can now be utilized to conduct BMI at AVL. The completed and adapted gate criteria can be seen in Attachment 5. The questions contained therein, which check and evaluate the maturity of the BM, have also been created considering the 13 design requirements. They check the topics that have been identified as important for business model innovation. Furthermore, cross-references are shown that indicate with which business model development tool the information to be evaluated can be obtained. In addition, the questions contained in the criteria have been aligned with the final tools and specifically check their content.

7 Contribution to the Playbook

The following chapter deals with the contribution of the master thesis to the playbook. This contribution corresponds to the framework objective of the objective hierarchy (Figure 12). The playbook is intended to guide AVL´s employees in the correct handling of business models. First, this chapter describes how the playbook is structured. Then, it describes the elements which have been created for the playbook within the course of this master thesis.

7.1 Structure of the Playbook

The structure of the playbook is shown to illustrate the larger picture in which the results of the master's thesis are embedded. The elaboration of the contents of the playbook is not subject of this master thesis. However, certain elements for the playbook have been created. They are described in the next section.

The playbook is a larger project at AVL that is being undertaken concurrently with the efforts of this master's thesis. The playbook represents a knowledge pool on how to deal with business models. This also includes the topic of business model innovation. Thus, the topics of this project and the master thesis overlap, and several contents of the master thesis find their way into the playbook. Furthermore, it is the declared goal to contribute elements to the playbook.

A first contribution to the creation of the playbook is the design of its general structure. The playbook is designed as a modular guideline. This is due to two reason: First, multiple people are collaborating in the creation of the playbook. The modular architecture enables the contributors to work on their assigned modules simultaneously. Second, each contributor has expertise in his assigned module. These circumstances justify the usage of modular guidelines (Kothes, 2011, p. 230). Moreover, the modular structure eases the maintenance and potential modifications of the guideline.

For the creation and distinction of the individual modules the following must be given (Kothes, 2011, p. 235):

- Semantic definiteness: Each module is assigned only one topic or one section.
- Completeness of content: The content of a module must not be accessible via several modules.
- Reusability: When designing a module, it must be considered that the module is to be reused in different applications.
- Identifiability: Each module must be identifiable based on certain criteria in order to ensure reusability.

Considering these criteria, the contributors and AVL responsibles agreed on the following modules:

- Analyzing a business model
- Innovating a business model
- Implementing a business model
- Monitoring a business model

As Kothes (2011, p. 230) outlines, the modules are characterized by a recurring structure. Therefore, each module features the same chapter structure. The individual chapters are:

- Intention & goals: This chapter gives an overview about the topic and the underlying objectives.
- Strategy: This chapter highlights the connection between the module´s topic and the pursued AVL strategy.
- Contact persons: This chapter lists people who can provide help within the module´s topic. Additionally, this chapter shall comprise lessons learned of the contact persons.
- Needed resources: This chapter describes and provides the needed resources to apply the module´s contents.

Figure 25 illustrates the structure of the playbook and their chapters.

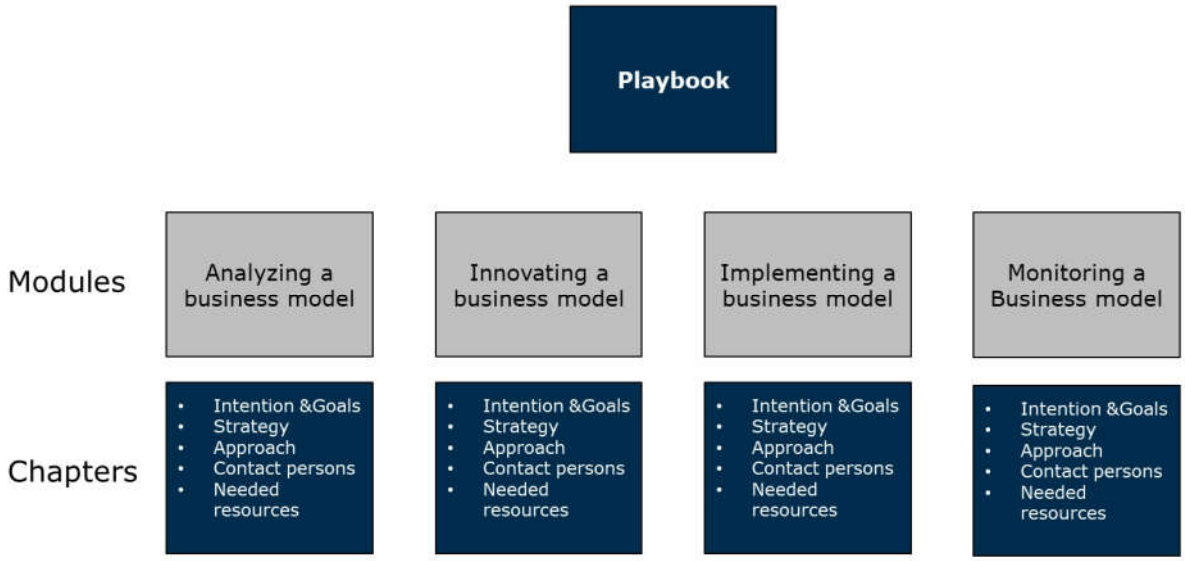


Figure 25 Structure of the Playbook

7.2 Elements contributed to the Playbook

The finally designed process is the core of the playbook´s module about business model innovation. The chapters and contents of this module largely revolve around the finished stage gate process including its stage activities and gate criteria. All considerations, illustrations and lists made during the master thesis lay a foundation for this module. Further, it comprises the knowledge about business model innovation which has been gathered within the interview series. The actual and entire elaboration of this playbook´s module is not the subject of this master thesis. However, certain elements have been created for it. These elements are intended to support the application of the stage gate process for business model innovation. Together with AVL responsibles it has been agreed to create following elements:

- BPMN depiction of the entire process
- Sequence diagrams of each phase of the stage gate process
- Information flow diagrams
- Explanatory profiles of the various business model development tools

BPMN depiction

BPMN (Business Process Modelling Notation) is a standard, graphical modelling representation for business processes. It represents a flowchart notation that is independent of the implementation environment. A BPMN illustrates how the business functions of an organization collaborate and are interconnected within a given process. Further, it shows the interfaces to external parties – customers, partners, and suppliers. (White & Miers, 2008, pp. 9-12) Regarding the stage gate process for business model innovation, the created BPMN depiction helps to clarify which parties are responsible for which activities and decisions. Further, it visualizes at which point of the process which information shall be available and to whom it shall be directed. The BPMN depiction can be seen in Attachment 6.

Sequence diagrams of each phase of the stage gate process

A Sequence diagram fulfils a similar purpose as the BPMN depiction only on a different level of abstraction. (Tarandach & Coles, 2020, p. 19) The sequence diagram, which goes into more detail than the BPMN, illustrates the sequence of actions within a phase of the stage gate process. It describes which business model development tools are to be utilized at which point of the process and it also visualizes the characteristics of the decision-making process.

Information flow diagrams

An information flow diagram illustrates the logical design of a system. It shows graphically how information flows within a system, where it is generated and to whom it is addressed. (Tan, 2001, p. 62) In the regard of this stage gate process, the system corresponds to a phase of the process and the entities, in which the information is generated correspond to the business model development tools. Hence, the information flow diagrams created for the playbook visualize how information is generated by the various business model development tools and how they feed each other with information. As each stage of the process leads to a final tool, the information flow diagrams show how the other business model development tools constitute the final tool. Attachment 5 shows the information flow diagrams that have been created.

Explanatory profiles of the various business model development tools

The stage activities largely revolve around the utilization of various business model development tools. These are for example SWOT analyses, customer profiles or the application of scenario techniques. To provide information about how, when, and why to utilize which business model development tool, profiles for each individual tool were have been created. These profiles describe the required precautions for each tool, refer to sample solutions, argue their advantages and disadvantages, and provide guidance

on the correct handling of the tools. Furthermore, these profiles feature tips and tricks that emerged from the interview series. These profiles can be seen in Attachment 6.

8 Evaluation of the Thesis´ Results

This chapter deals with the set objectives from a retrospective point of view. It is verified if and how the objectives are reached.

According to Ahrens (2012, p. 10), the last step of the problem-solving cycle is the evaluation of the goals. Retrospectively, it is determined whether the goals declared at the beginning of the master thesis (see Figure 12) have been achieved.

Collection of the Requirements for the Process:

To adapt the process to the needs of AVL, clear requirements had to be formulated first. Therefore, a series of interviews was conducted to find out how AVL employees approach the topic of business model innovation. Furthermore, lessons learned from conducting business model innovation were discussed and recommendations for the design of the stage gate process were obtained. Consequently, 13 design requirements could be derived from the interviewees' statements, representing the achievement of this goal (see Section 6.1).

Optimization of the Stages of the Stage Gate Process:

Here, the goal was to integrate all previously collected design requirements into the stages of the process. Therefore, solutions how to weave the individual requirements into the process have been searched for. Subsequently, the stages have been adapted to the needs of AVL and all design requirements were integrated into the stage gate process. Thus, this goal has been achieved. The entire adaptation can be seen in Section 6.3). An example for this adaptation is the introduction of a final tool to meet the requirement ‘featuring clear deliverables. The input for an upcoming gate is now provided by a suitable template. Furthermore, the requirement ‘alignment with AVL strategy’ was met by including a portfolio check in the stage activities of stage 0.

Adaptation and Completion of the Gates of the Stage Gate Process:

The sets of assessing gate criteria were mere fragments and uncomplete before the contributing efforts of this master thesis. After the design requirements have been identified, workshops have taken place. These workshops have elaborated complete sets of assessing questions for each gate of the process. The contents of these questions were formulated with respect to the design requirement. Thus, this objective is achieved. The completed gate criteria can be seen in Attachment 5.

Contribution to the Playbook:

This master thesis at hand serves as a fundament for the playbook and its module about business model innovation. All discoveries, considerations and documents that were made throughout the course of this master thesis contribute to the creation of the playbook. Additionally, certain elements were created for the playbook within this master thesis. These are, for example, information flow diagrams, and sequence diagrams, which support the application of the stage gate process. Hence, this objective is achieved.

Process ready for use:

The overall goal has been achieved by the accomplishment of its subordinated goals. From now on, AVL employees can access a stage gate process for business model innovation that is tailored to their needs.

9 Summary of the Master Thesis

This chapter deals with the executive summary of the master thesis. Further, the contents and results are summarized.

9.1 Initial Situation

The rise of digitalization and the upcoming of data-driven business models have evoked the need for structured business model innovation (BMI) at AVL List GmbH. In this respect the development of a stage gate process for BMI has been initiated to support AVL´s employees coping with these market trends. However, the stage gate process was a mere idea and incomplete at the time this master thesis was started. Up to then, there has been no agreement on the planned stage activities, their quantity, and their sequence. Furthermore, only fragments of the assessing gate criteria existed. Therefore, this stage-gate process needed adaptations and refinements at various ends to be actively used at AVL. This led to the arousal of the research question, to which this master thesis is dedicated:

How shall a stage gate process for business model innovation be designed in order to be implemented successfully at AVL?

Meanwhile, an additional project was being initiated at AVL: the creation of an AVL internal guideline on business model management. This so called ‘playbook’ is intended to guide AVL´s employees in the correct handling of all topics, which are related to business models. As the topics of the stage gate process for BMI and the playbook overlap, the declared aim is that the content of the master's thesis contributes to the creation of this playbook. Moreover, this stage gate process shall represent the core of the playbook´s module about BMI.

9.2 Objectives

The general objective of this master thesis is to fully mature this stage gate process, thus, to make it ready for use for AVL´s employees. This general objective is divided into the adaptation of the stages, the corresponding stage activities, and the completion of the gate criteria. The final stage gate process shall be designed to meet the needs and preferences of AVL´s employees. Therefore, these needs and preferences must be identified in a first step. Consequently, a declared objective is to formulate design requirements upon which the adaptation of the stage gate process is conducted.

With respect to the playbook, it is the objective of this master thesis to contribute to its creation. This means the provision of useful company internal insights about BMI and the elaboration certain elements for the playbook. These are for example diagrams and depictions which support the application of the stage gate process.

9.3 Search for Solutions

To identify design requirements for the stage gate process it was agreed to conduct an interview series. The selected interviewees were AVL employees who deal with business model innovation and data-driven business models on a regular basis. An interview guide was created to support the interview series. This interview guide was centred around three leading questions from which the design requirements were derived:

- How is business model innovation being done at AVL?
- What best practices and lessons learned in the field of BMI are there?
- What requirements do employees place on processes to make them as user friendly and as much likely to be used as possible?

The first question aimed to evaluate how the topic of BMI is being approached within AVL. It was discussed what individual steps are taken and if the interviewees followed textbook approaches. The second question gathered the individual lessons learned by the interviewees. Tips and tricks were discussed which have proven useful to facilitate successful BMI at AVL. The third question directly addressed the requirements which the interviewees placed on the stage gate process. Additionally, a questionnaire was created to evaluate which business model development tools and patterns are actively used for business model innovation (e.g. Business model canvas, PESTEL analysis etc.). This questionnaire intended to find the most suitable stage activities for the stage gate process.

Within this interview series eleven interviews with employees took place.

Interview results:

The results of the first leading questions showed that most of the interviewees apply the ‘Lean startup approach. Accordingly, BMI involves the formulation of business hypotheses which are verified by feedback loops. Within these feedback loops the creation of minimum viable products (MVP) plays an important role. The feedback is inquired from the customers with the means of these MVP. Regardless of the textbook approach, customer proximity and the acquisition of customer feedback are key elements within business model innovation at AVL, according to the interviewees.

Amongst many others, the most stated lessons learned was the alignment with the corporate strategy. Hence, it was concluded that alignment with corporate strategy is one of the key factors under which an innovation project is supported.

Exemplarily for the third question, the interviewees stated that clear and distinct deliverables upon which binding decisions can be made are beneficial for the design of a process.

Adaptation of the stage gate process

The interview results were analyzed, from which 13 design requirements could be derived for the stage gate process. These design requirements were formulated with respect to the aspects which were stated to be valuable by the interviewees. It was the declared goal to incorporate all design requirements into the stage gate process. Subsequently, ways to integrate the requirements were elaborated. For example, the requirement for strategy alignment was met by incorporating a compulsory portfolio check. Moreover, the requirement for clear deliverables was met by introducing final tools, which summarize all contents of the regarding stages within the process. The former incomplete stage criteria were completed by formulating criteria which also respected the design requirements.

9.4 Results

The initially posed research question was answered as follows: The interview series about BMI led to the formulation of 13 design requirements for the stage gate process. Subsequently, the stage gate process was adapted by implementing these 13 design requirements. Therefore, the major result of this master thesis is a complete stage gate process for BMI which is precisely tailored to the needs of AVL. Further results include the various elements that support the application of the process that were created for the playbook. These elements are for example BPMN and sequence diagrams of the process.

10 Outlook

In conclusion, the elaboration of the completed stage gate process is a contribution to AVL's competitiveness in the field of data-driven business models. From now on AVL´s employees can access the stage gate process for successful BMI. Moreover, future applicants of the process will be able to access the playbook for supportive information about business models and the stage gate process itself. In the future, one should investigate whether the introduction of the process at AVL was successful or not. This will be reflected in two aspects. First, attention will be paid to whether the applicant subjectively feels supported by the process. It will be seen if the applicant perceives the process as a support or as a tiresome duty. Second, the success of this introduction will be measured by the results of the stage-gate process. In this way, management will evaluate the resulting business model innovations and whether the application of the process has led to an improvement in project work. In final terms, it also cannot be ruled out that further changes will be made to the stage gate process.

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Attachments

1 Interview guide

Introduction

Current trends such as digitalization, connectivity and the growing amount of data open new opportunities in business model innovation.

In order to facilitate the successful innovation of 'data-driven business models' in AVL, a structured stage gate process for business model innovation shall be defined. This process aims to give recommendations and share best practices across AVL.

This interview aims to analyze the prevailing approach in business model development at AVL. In addition, special attention will be drawn to procedures and experiences from past projects.

Based on the findings, the stage gate process and the requirements placed on it will be optimized.

Demographic Data

1. In which department of AVL do you work?
2. What is your current role and your main responsibilities?

Interview about Business Model Innovation at AVL

Business Modeling

1. What is a business model? How do you bound this term?
2. What is business model innovation in your understanding?
3. Are you dealing with business model innovation in your job? How much time do you invest on that topic?
4. Do you know any guidelines for business model analysis and development in AVL?
5. Which challenges do you currently see in business model innovation?
6. Do you know the following tools/methods, and have you worked with them?

No.	Tool/Method	Do you know it?	Have you worked with it?	Positive / negative experiences?	Do you emphasize its usage?	Remarks?
1	Business Model Canvas					
2	Value Proposition Canvas					
3	Business Model Patterns					
4	Scenario Technique					
5	Data Map					
6	Data Product Canvas					
7	Data Service Cards					
8	User Stories					
9	Customer Persona					
10	SWOT Analysis					
11	PESTEL Analysis					

12	Porters 5 Forces					
13	Stakeholder Analysis					
14	Return on Investment					
15	Business Roadmap					
16	Customer Surveys					
17	Business Model Risk Matrix					
18	Digital Value Creation Framework					

Business model development in practice

1. Was there a structured business model innovation approach in one of your latest projects?

2. What was the approach and who was responsible for it?

3. Which business modeling tools/methods were used in that project?

   When and how did you apply those tools?

4. Did the use of those tools give you insights you would otherwise not have come across?
5. Was the customer involved in the development of new business models? If yes, at what time and how did you discuss new business models with the customer?

6. Do you think a defined business model development process at AVL could add value or help avoid failures in projects? Would you follow such a process?

7. Are you used to follow processes in other areas of your work? In which contexts do you follow processes, and do you see a benefit in that?

8. How could an ideal tool guide you through the business modeling process? Do you know any tool that could be suitable for that purpose?
9. Do you want to share any additional best practices or lessons learned from business model development?

Outlook

The results of this interview series will be processed as follows:

1. Outline the current state of business model development and used tools
2. Projection of improvement potential on the stage gate process for business model development
3. Adaptation and fine-tuning of the stage gate process

The results will be published in the master thesis

In addition, a 'playbook' with recommendations for action and best practices will be published, which will serve as a guide for future business model development within AVL.

Contact

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THANK YOU FOR YOUR TIME!

2 Stage Gate Process before its adaptation

The following shows the documents of which the stage gate process consisted before its adaptation

2.1 Gate Criteria

The gate criteria which was incomplete before its adaptation looked like follows:

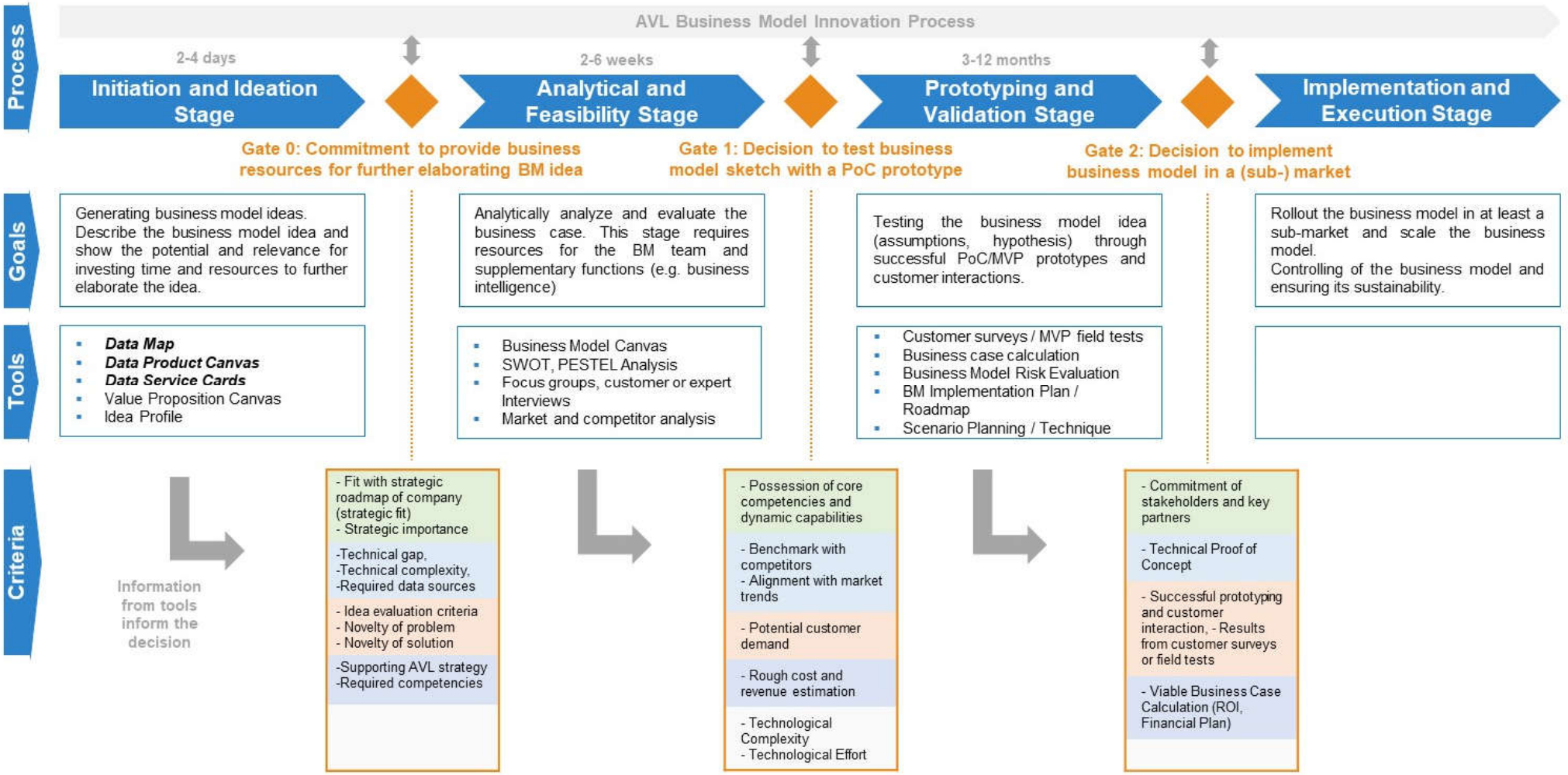
No.	Gate	Dimension	Question	Criterion	Supporting tool
G0-C1	0	Customer	Who is our customer?	Specific customer identified	Personas
G0-C2	0	Customer	What are the needs and problems of the customer?	Clear customer need addressed	Value Proposition Canvas
G0-C3	0	Customer	What is our offering and value proposition? Argue how this is a novel approach!	Novelty of offering	Value Proposition Canvas
G0-F1	0	Finance	Describe how the business model has a potential to scale!	Scaling potential	-
G0-M1	0	Market	Describe what market and industry trends the BM idea addresses!	Alignment with market and industry trends	-
G0-O1	0	Organization	Describe how the BM idea fits to our strategy!	Strategic fit	-
G0-O2	0	Organization	Who else within our organization has experience in that topic? What other departments would benefit? What are potential synergies?	Potential synergies	-
G0-O3	0	Organization	Who is the responsible person for this use case? Who will be in the BMI core team?	Team experience	-
G1-C1	1	Customer	Do we have access to our (potential) future customers?	Customer access	
G1-C2	1	Customer	Do we already have identified and contacted lead customers?	Lead customers	
G1-C3	1	Customer	Have we verified the customer demand / problem / need?	Verfied customer need / demand	Customer Interviews
G1-C4	1	Customer	How easy is it to communicate the value of our solution to (potential) customers?	Ease of value communication	Customer Interviews
G1-C5	1	Customer	Do we have a unique value proposition compared to our competitors?	Unique value proposition	Competitor Analysis

G1-O1	1	Organization	Do we possess the required core competencies and dynamic capabilities? Does the business model idea fit to our capabilities?	Capabilities and competencies	
G1-O2	1	Organization	How does the business model idea influence our processes and requires changes?	Organizational changes	
G1-O3	1	Organization	Who are the main internal stakeholders and external partners that are needed for this business model? What is the main value they are providing and what is their benefit? Do we have intended interest of potential key partners and internal stakeholders?	Interest of key partners	Stakeholder Network Diagram
G1-O4	1	Organization	Do we have synergies with other business models or will we be competing?	Synergies	
G1-M1	1	Market	Who are our main competitors? What are the strenghts and weaknesses of our offering compared to the offering of our competitors?	Benchmark with competitors	
G1-M2	1	Market	Describe what market and industry trends the BM idea addresses!	Alignment with market and industry trends	
G1-M3	1	Market	Market analysis (growth rate, competitive intensity, available alternatives)		Market Analysis
G1-M4	1	Market	What is the our planned time to market? What is the estimated window of opportunity for this offering? How well is the time to market aligned with the window of opportunity?	Time to market vs. window of opportunity	Business Model Road Map, Implementation Plan
	1				
G1-F1	1	Finance	What is our expected return in relation to the estimated costs	ROI / cost-benefit	Cost-Benefit Analysis, ROI
	1	Finance	Revenue Model Design and Pricing Mechanism		Pricing Patterns, Evaluate Willness to Pay

G1-F2	1	Finance	What would be the maximal affordable loss, if the business model initiative would fail and is this acceptable?	Affordable Loss	
G1-R1	1	Risk	What are potential risks for the business model and/or our organisation?	Potential Risks	SWOT Analysis, Risk Factor Checklist, Value Network Analysis
G1-KPI1			**Complete Business Model Canvas**		Business Model Canvas, Business Model Workshop, Business Model Patterns

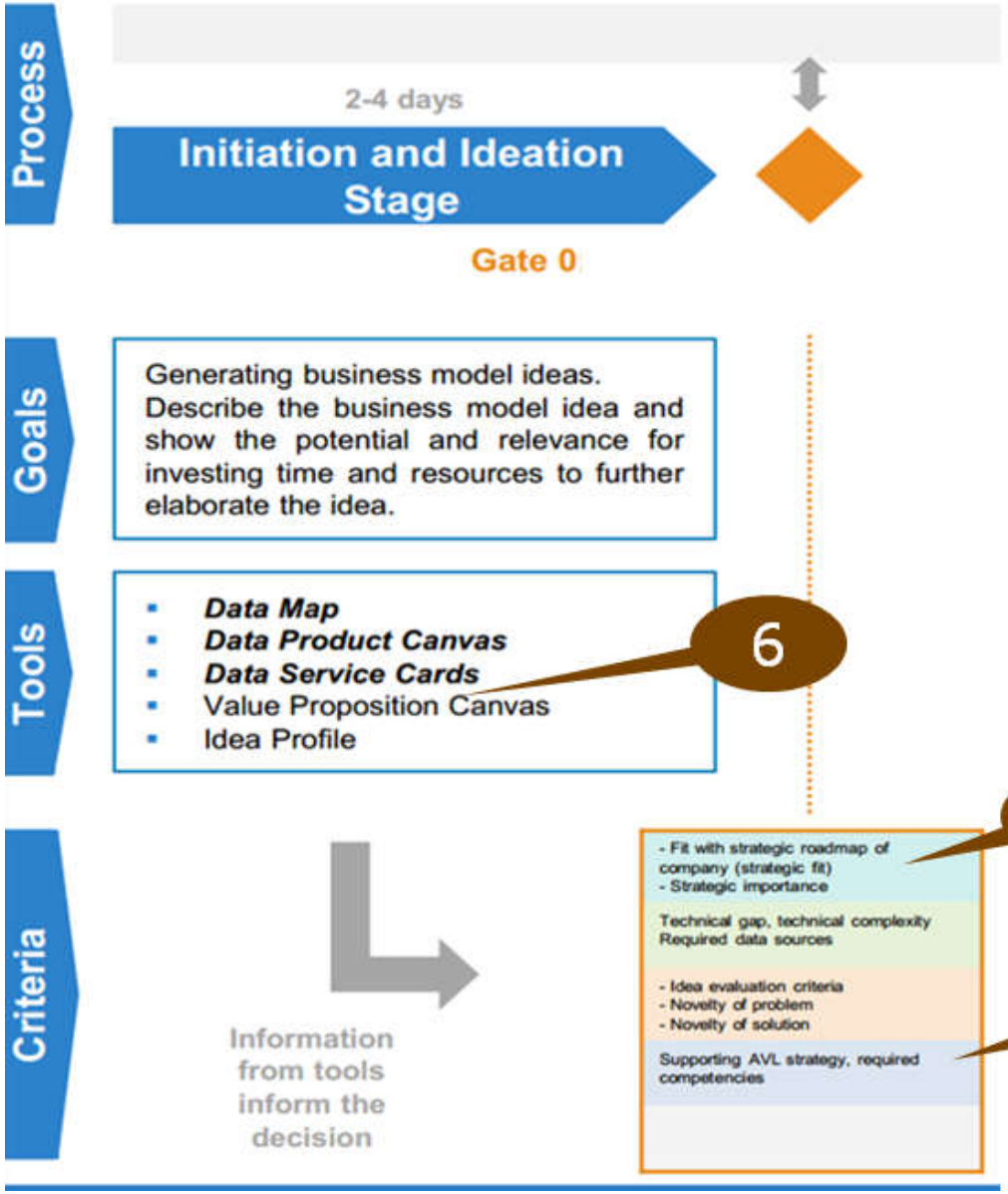
2.2 Process depiction

This depiction shows the draft of the Business Model Innovation Process before its adaptation



3 Detection of the design requirements that were already implemented in the stage gate process

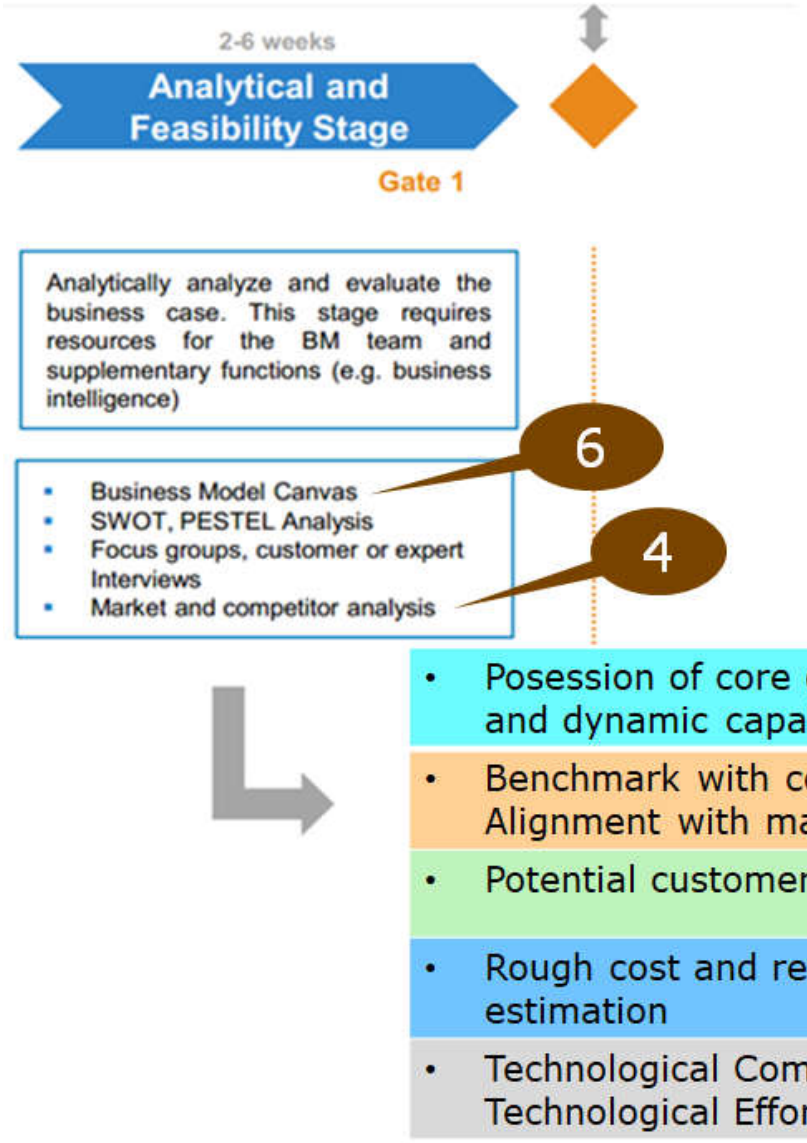
The following illustrates how the design requirements that were already implemented in the stage gate process before its adaptation were identified. Hence, parts of the stage gate process ‘depictions are shown, and the bubbles indicate the identified design requirements.



6 Wide Spread of the tools BMC & VPC

4 Market analysis

5 Alignment with corporate strategy

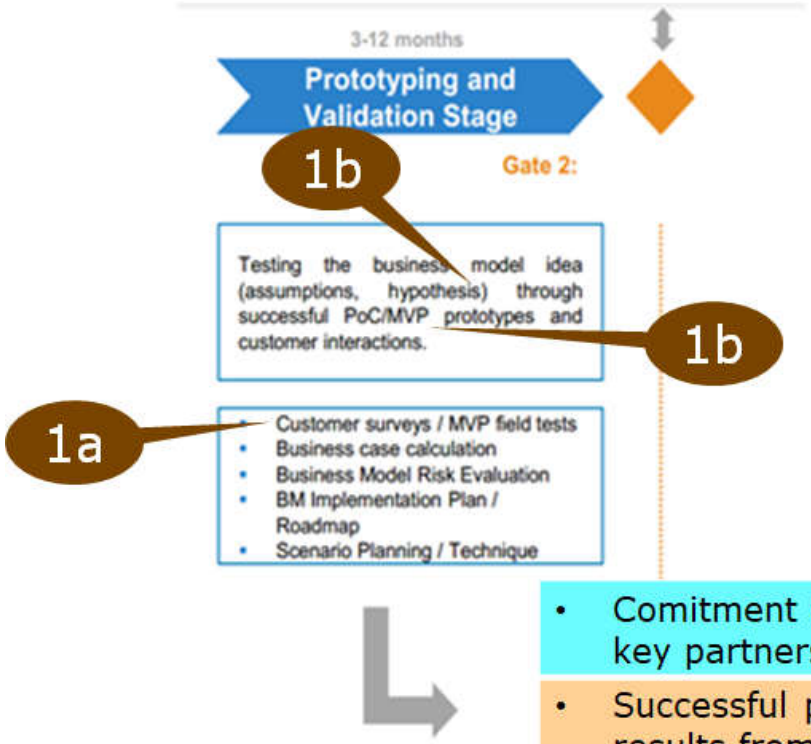


6 Wide Spread of the tools BMC & VPC

4 Market analysis

5 Alignment with corporate strategy

2 Conduction of a need assessment analysis



1 Following the lean start up approach

a.) Maintaining customer proximity

b.) Formulating and testing hypotheses

c.) Iterating the BMI

d.) Creation of an MVP

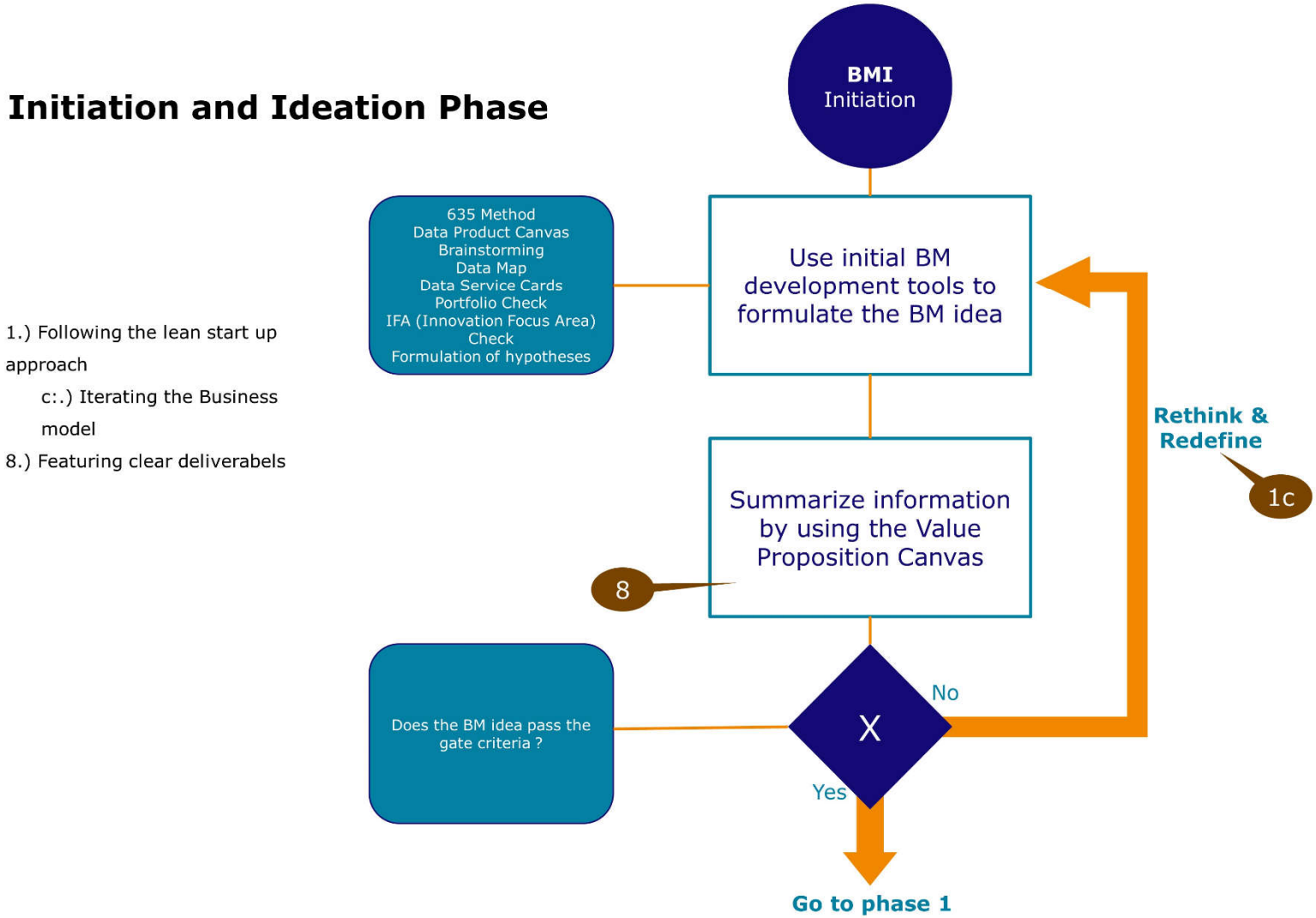
10 Gather commitment from superiors by using networks in which ideas are promoted

- Comitment of stakeholders and key partners — 10
- Successful prototyping results from customer surveys or field tests — 1b, 1d
- Viable business case calculation (ROI, Financial Plan
- Technical Proof of Concept

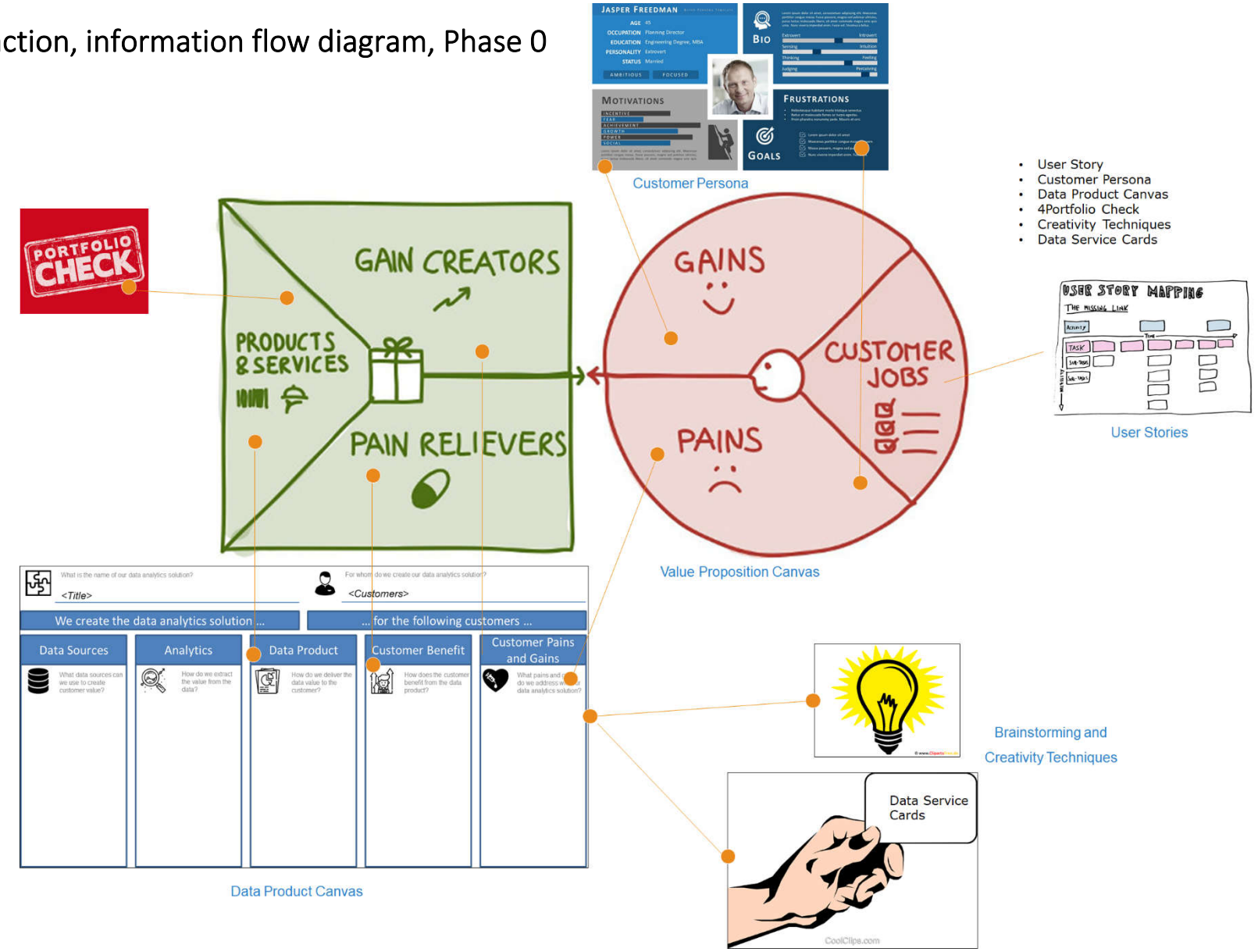
4 Contributed elements to the playbook

Here, the elements which have been created as a contribution to the playbook are shown. The bubbles indicate the integrated design requirements.

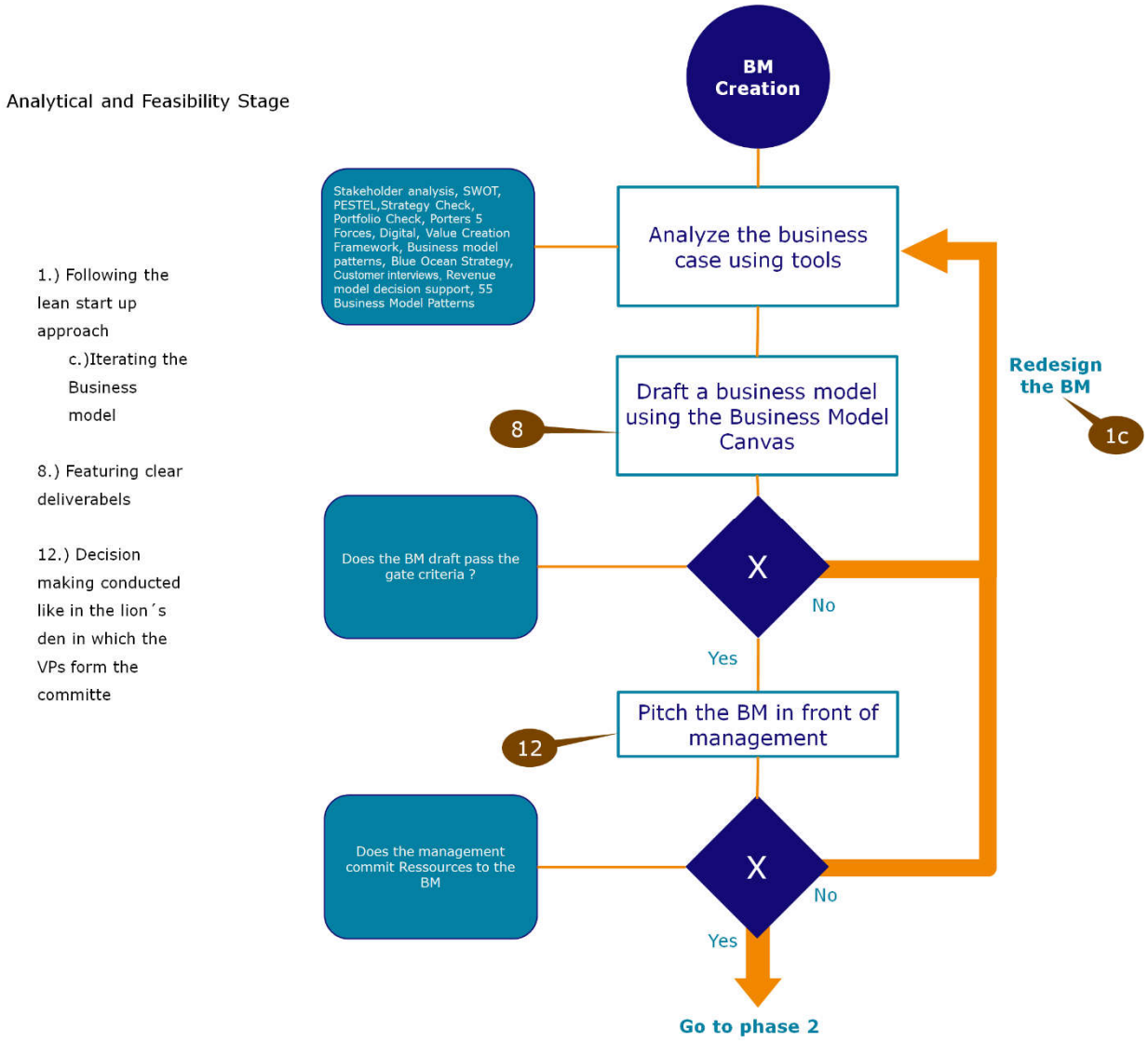
4.1 Sequence Diagram, Phase 0



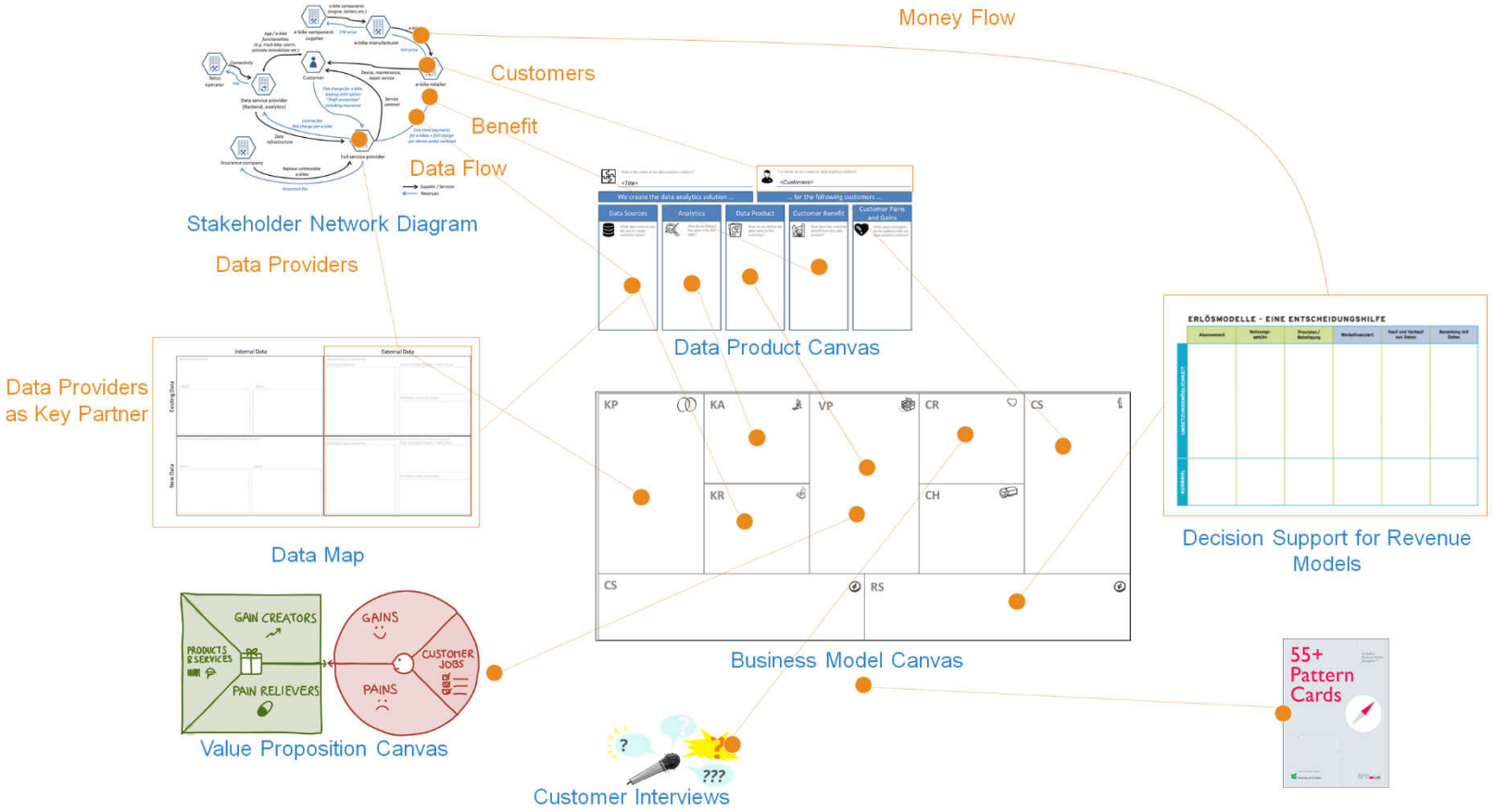
4.2 Tool interaction, information flow diagram, Phase 0



4.3 Sequence diagram, Phase 1



4.4 Tool interaction, information flow diagram, Phase



5 Completed gate criteria

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G0-C1	**0**	**Customer**	Who is our customer (buying persona)? Who is our user (user persona)?	Specific customer identified	1 … 5	5 … 2-3 personas comprehensively described in a personas template; buying and user persona clearly distinguished 4 … 1 clear personas described in personas template or no clear distiction between buying and user persona 3 ... Customer personas described insufficiently / incomplete 2 … Customer defined on organizational-level (e.g. OEM, Government) 1 … No specific customer identified		Customer Segment	Clear description of a specific customer segment
G0-C2	**0**	**Customer**	What are the needs and problems of the customer? What problem do we want so solve?	Clear customer need addressed	1 … 5	5 … A significant and meaningful customer problem is identified (and several gains/pains ranked) 4 … Rough perception of significant customer gains/pains, but not yet clearly described in detail 3 … Peripheral problems identified; customer could have other more significant problem 2 … Only high-level / obvious problem identified (e.g., time or cost preasure) 1 … No specific customer gain/pain identified		Need Map	Clear description of a meaningful customer problem or need

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G0-C3	**0**	**Customer**	What is our aimed offering and value proposition? Argue how this is a novel approach!	Novelty and potential of the offering	1 … 5	5 … The new offering could add important advantages for the potential customer, either huge savings in effort and money or real and exciting benefits. It is easy to implement and require low economic investment or technological ressources. 4 … 3 … Mediocre effort and benefit relation (the offering would provide significant benefit for the customer but it requires major economic and/or technological ressources) 2 … 1 … The new offering wouldn't add value or differentiation compared to existing options.		Value Proposition	Clear description of an idea for the desired offering and value proposition
G0-F1	**1**	**Finance**	Describe how the business model has a potential to scale!	Scaling potential					
G0-M1	**0**	**Market**	Describe what market and industry trends the BM idea addresses!	Alignment with market and industry trends	Y/N			-	Description how the BM idea addresses or links to market and industry trends

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G0-O1	**0**	**Organization**	Describe how the BM idea fits to the strategy of your organizational unit!	Strategic fit	Y/N	Y … (e.g. idea within innovation focus area) N ...		-	Description how the BM idea addresses or links to the strategy of AVL and/or the organizational unit within AVL
G0-O2	**0**	**Organization**	Who else within our organization has experience in that topic? What other departments would benefit? What are potential synergies?What existing elements (products, services, technologies, …) could be reused?	Potential synergies	Y/N			-	Description of existing elements that could be reused, internal departments and/or persons who have already experience in that field
G0-O3	**0**	**Organization**	Who is the responsible person for this use case? Who will be in the BMI core team?	Team setup	Y/N			-	Description of the potential business model innovation team
G1-C1	**1**	**Customer**	Do we have access to our (potential) future customers?	Customer access	Y/N	Y … already in contact with customers through other offerings/projects N … no contact with customers		Customer Segment	

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G1-C2	**1**	**Customer**	Do we already have identified and contacted lead customers?	Lead customers	Y/N	Y … lead customers identified (KPI = number of lead customers) N … no contact with customers	Number of contacted lead customers (e.g. LOIs received)	Customer Segment	
G1-C3	**1**	**Customer**	Have we verified the customer demand / problem / need?	Verfied customer need / demand	1…5	5 ... demand has been approved by several customers using several testing methods 4 … demand approved by several customers (but only by one method) 3 … demand approved by one external customer 2 … feedback only acquired by AVL internal customer 1 … no customer feedback acquired	Number of testing methods Number of customer interactions		
G1-C4	**1**	**Customer**	How easy is it to communicate the value of our solution to (potential) customers?	Ease of value communication				Value Proposition	

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G1-C5	**1**	**Customer**	Do we have a unique value proposition compared to our competitors?	Unique value proposition	Y/N	Y … One point of Differentiation Strategy addressed (Examples: Lower costs for the customer through new approach Differentiating product features or quality Convenience (availability and timing) ---> niche market N … No specific differentiation		Value Proposition	
G1-O1	**1**	**Organization**	Do we possess the required core competencies and capabilities? Does the business model idea fit to our capabilities?	Capabilities and competencies	Y/N	Y … the most important required core competencies are already existing within AVL N … One or more **core** competencies cannot be found within AVL			
G1-O2	**1**	**Organization**	How does the business model idea influence our processes and requires changes?	Organizational changes					

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G1-O3	**1**	**Organization**	Who are the main internal stakeholders and external partners that are needed for this business model? What is the main value they are providing and what is their benefit? Do we have intended interest of potential key partners and internal stakeholders?	Interest of key partners	Y/N	5… internal and external stakeholders greatly benefit from the business model and are willing to support the business model with resources. 3 … 1 … No specific intended interest has been identified		Key Partners	
G1-O4	**1**	**Organization**	Will we be competing with other internal business models or organizational units?	Synergies	Y/N	Y ... Potential internal competition identifiedN … No internal competition			
G1-M1	**1**	**Market**	What is the competitive intensity in the market? Who are our main competitors?	Benchmark with competitors	1 … 5	5 … No competitors 4 … Minor competition 3 … Several equally competing competitors 2 … Intense Competition 1… Many major competitors, of which one or more are well established	No. of direct competitors	-	

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
	1	**Market**	What are the strenghts and weaknesses of our offering compared to the offering of our competitors? What can we learn from our competitors	Benchmark with competitors	Check if done				
G1-M4	**1**	**Market**	What is the our planned time to market? What is the estimated window of opportunity for this offering? How well is the time to market aligned with the window of opportunity?	Time to market vs. window of opportunity	Y/N	Y … Alignment is given N … No Alignment is given	Time to market; Time span of window of opportunity	-	
G1-F1	**1**	**Finance**	What is our expected return in relation to the estimated costs?	ROI / cost-benefit	Check if done		KPI: ROI Exstimation	Cost Structure, Revenue Model	
	1	**Finance**	Revenue Model Design and Pricing Mechanism						

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G1-F3	**1**	**Finance**	What is the willingness to pay of our customer?	Willingness to pay	1 … 5	Paying for similar products/services	KPI: Estimated Willingness to Pay KPI: Used evaluation methods		
G1-F2	**1**	**Finance**	What would be the maximal affordable loss, if the business model initiative would fail and is this acceptable?	Affordable Loss	Check if done		KPI: Affordable Loss (in €)	Cost Structure	
G1-R1.1	**1**	**Risk**	What are potential risks for the business model and/or our organisation?	Risks identified	Check if done				
G1-R1.2	**1**	**Risk**	What are potential risks for the business model and/or our organisation?	Risk assessment	1 … 5	1 …. Unacceptable risks (critical consequencies and high probability) 3 …. Acceptablie risks with mitigation 5 …. Acceptable risks (low proability and low consequencies)		-	

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G1-R2	**1**	**Risk**	**What are the main uncertainties in the current business model design? (i.e., With what accuracy have the above questions been answered? Are there any unanswered questions?)**	**Uncertainties in Business Model Design**	**Check if done**				
G1-KPI1	**1**	**-**	**Complete Business Model Canvas**		Check if done				
G1-KPI2	**1**	**-**	**Provision of a Business Model Road Map / ImplementationPlan**		Check if done				
		Data	What is the origin of our data sources?						
G2-0	2	Organization	Do we have received the commitment of all necesarry stakeholders and key partners? Do we have set up all the necessary contracts?	Commitment of stakeholders and key partners	Check if done				

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G2-1	2	-	Have we developed mechanisms to protect our business model to aviod imitation of the business model?	Imitation or protectability mechanism developed	Check if done				
G2-2	2		Was the prototyping and the interactions with the (lead) customers successfull? (confirmed customer demand and corresponding solution)	Successful prototyping and customer interaction (results from customer surveys or field tests)	Check if done				
G2-3	2	Customer	Have we evaluated and confirmed the willingness to pay of the customer?	Evaluation of Willingness to pay	Check if done				
G2-4	2	Finance	Have we calulated a viable business case in detail? (ROI, certaincy of returns) Do we have a financial plan for the next years? (cash flow plan)	Viable Business Case Calculation (ROI, Financial Plan, certainty of returns)	Check if done				

No.	Gate	Dimension	Question	Criterion	Metric	Scale for Evaluation	KPIs	BM/VPC Block	Expected output
G2-5	2	Technology	Have we evaluated the technical feasibility? Has our MVP reached its final form, with all issues solved?	Technical proof of concept	Check if done				
G2-6	2	Risk	Have all identified risks been evaluated and quantified?	Business Model Risk Evaluation	Check if done				
G2-7	2	-	Have we evaluated different scenarios how the business model could evolve based on a changing environment?	Scenario Planning Done	Check if done				
G2-8	2	-	Have we defined a roadmap for rollout and further development of the business models?	Business Model Roadmap	Check if done				
G2-9	2	Organization	Do we have an operations model for the new business model (including maintenance, customer support, infrastructure,…)	Operations Model defined (Maintenance, Customer Support, …)	Check if done				
G2-10	2	Organization	Have we defined the responisbilties and processes for sales of the new offering?	Sales responsibilities and process defined	Check if done				
G2-11	2	-	Are all hypothesis in the business model verified?	Hypothesis verified	Check if done				

6 Digital attachments

6.1 Tool profiles

The description of how all business development tools are to be utilized can be found in the digital attachments.

6.2 Business Process Model and Notation Diagram about the entire Stage Gate Process

The BPMN Diagram can be found in the digital attachments.