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Agile Innovation

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supervised by
Univ. Prof. Dr. **Christopher Lettl**

DI(FH) **Nina Zenz**
1426314

Vienna, June 22, 2016

Affidavit

I, Nina Zenz, hereby declare

1. that I am the sole author of the present Master's Thesis, "Agile Innovation", 89 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, June 22, 2016

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DI(FH) Nina Zenz

Abstract

The aim of this master thesis is to propose a methodological framework that facilitates the development of innovative products within large enterprises. The agile innovation model is designed to increase the speed of product development while at the same time allowing for enough flexibility to adapt products according to feedback from the market. Agile innovation does not only deal with the product development itself but also provides a comprehensive framework that encompasses the facilitating factors which are necessary to create an environment that is conducive to innovation.

However, large firms struggle with transforming their product development efforts towards an agile innovation model due to hierarchical structures and processes that focus on stability and predictability. Therefore, this thesis develops an approach that describes the transition of large organizations from traditional product development towards the agile innovation model. It draws on findings from the field of change management to describe the necessary steps and develops a set of recommendations for organizations that attempt this transformation.

The research questions focus on the agile innovation model itself and the description of the transformation process. Both are developed based on a review of extant literature and are empirically validated by conducting a qualitative case study in an Austrian telecommunications company. Based on the findings of a series of in-depth interviews, the agile innovation model is amended. The empirical findings confirm the validity of the agile innovation model and support the need for a structured approach to transformation.

This thesis contributes to the discourse on agile product development by providing a better understanding of its holistic nature, the interplay of existing agile methods from various fields and the importance of enabling factors within an enterprise. It proposes a pragmatic yet systematic approach to innovation and transformation that can be applied in an enterprise context.

Keywords: agile, innovation, new product development, product development methods, change management, transformation, customer-centric

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To Georg and my parents for their love and support.

Nina Zenz

Contents

List of Abbreviations

CAPEX	Capital Expenditure
CEO	Chief Executive Officer
CFO	Chief Financial Officer
GRC	governance, risk management and compliance processes
IP	Intellectual Property
IT	Information Technology
MVP	Minimal Viable Product
PDP	Product Development Process
R&D	Research and Development
S&P	Standard and Poor's
UP	Unified Process

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1 Introduction

For virtually all companies, innovation is a critical activity upon which their success and longevity depends. They need to be able to rapidly innovate to meet the demands of increasing competition and succeed in their industries. The declining lifespan of large companies clearly illustrates the acceleration of competition: Richard N. Foster found that the average lifespan of an S&P company dropped from 61 years in 1958 and to 25 years in 1980. In 2012, it stood at just 18 years and the increasing pace of technological change will further accelerate this dynamic. (Foster 2012)

McGrath (2013) also highlights that sustainable competitive advantages are increasingly difficult to achieve. In a world where competitive advantages evaporate quickly, companies have to aim at creating transient advantages that are designed to rapidly exploit business opportunities as they arise. This means that companies not only need to develop innovative products, they also need to continually adapt their business models to new market conditions. (Chesbrough 2010)

Under the dynamic market conditions describe above, companies constantly face the challenge of improving their innovation-related capabilities to sustain their competitive advantage. Product development is one of these key capabilities that enable innovation. However, existing product development processes that are implemented in many large enterprises seem unfit to address this innovation challenge. (Salerno et al. 2015, Thomke and Reinertsen 2012, Chesbrough 2010) To make product development more customer-centric and flexible, the concept of agility has emerged in various domains such as design, software development and lean production.

Agile product development is not only associated with increased customer focus but it also facilitates the development of new business models under conditions of high uncertainty

relating to markets, target groups or customer needs. It enables experimentation and helps companies to probe for potential new business models before external innovations render their traditional ones redundant. (Chesbrough 2010) Agile product development methods originate from domains as diverse as design thinking, lean product development and software engineering and focus on enabling customer involvement and rapid experimentation to establish a fit between customers' needs and the product's features. However, to maximise their benefit in a product development process, these methods need to be combined.

In addition to proposing methods for creating new products, agile product development has also sparked a broader discussion on the need to think differently about issues such as strategy, culture or governance and how they influence product development. Various publications have acknowledged the need for these facilitating factors that create an environment conducive to innovation. (Humble et al 2015, van Kelle 2015, Nerur 2005)

In essence, this presents companies with the challenge to adapt not only their product development process but also other parts of the organization that influence product development: planning the product portfolio, allocating resources or managing the collaboration within project teams are just some of these aspects. Due to the magnitude of change, a structured change management process is needed to approach this transformation.

This thesis addresses this challenge and deals with the intersection of agile innovation methods, the necessary preconditions for innovation within an enterprise and the change process that companies face when they attempt to transform their approach to product development. This results in the following research questions:

1. How can agile product development methods from different fields be combined into a model that supports the development of innovative products in large firms? Which critical preconditions need to be in place in order to enable companies to use these methods effectively?
2. How do large enterprises effectively transition from existing product development processes towards the proposed agile innovation model?

To answer the first research question, this master thesis develops a holistic innovation framework that combines agile methods and tools from different fields. It describes the core innovation process as well as supporting factors that facilitate innovation within an enterprise. To address the second question, it draws on John Kotter's eight-stage change process and adapts it for the transformation towards the agile innovation model.

The thesis is structured as follows:

Chapter 1 highlights the importance of a holistic approach to agile product development against the backdrop of increasing competition and pressure to innovate. The chapter also includes the research questions and describes the structure of the thesis.

Chapter 2 reviews existing concepts, approaches and methods relating to the agile development of innovative products. The review covers concepts that originate from multiple domains of research and practice, such as design thinking, lean production and software development.

Chapter 3 introduces the agile innovation model that combines the methods discussed in the literature review. The model covers the core innovation process itself as well as supporting elements that facilitate agile product development in an organization.

Chapter 4 discusses the transformation from classical stage-gate product development processes to agile innovation. It analyses the differences between these two product development approaches and the challenges that established organizations face when attempting this transformation. Kotter's eight-stage change process addresses these challenges and is subsequently applied to the process of introducing agile innovation in an organization.

Chapter 5 assesses the validity of the agile innovation model in practice. For this purpose, a qualitative study is conducted in an Austrian telecommunications firm.

Chapter 6 provides a summary, an analysis of the thesis' contributions to research as well as concrete recommendations for the organization studied in chapter 5 relating to the transformation towards agile innovation.

2 Literature Review

To date, the concept of agility has been addressed in different fields of research, such as business agility, agile manufacturing or agile software development. Agility is currently not precisely or uniformly defined in all of those fields and although the general objective of creating sustainable profitable business is the same, the various disciplines address it from different points of view and at different and partially overlapping levels. (Kettunen 2009)

This chapter reviews existing concepts, approaches and methods relating to the agile development of new and innovative products. Particular focus is placed on the development of products that aim at exploiting a new business model that differs from the firm's existing business models and has not been validated in practice so far. Therefore, these products are developed under considerably higher uncertainty compared to products that extend a company's current product portfolio and are in line with an existing business model.

The concepts, which are discussed in this chapter, originate from different domains within both research and corporate practice fields. Three principles were applied when choosing the concepts as an input for this thesis:

1. Concepts need to cover the whole product development process from idea generation to the actual launch of a product. Each of the analysed concepts focuses on a specific step in this process but in sum, the whole product development process needs to be covered to generate the insights that are necessary to develop the agile innovation model in chapter 3. Therefore, open innovation and design thinking were selected to cover the initial phases of the innovation process including idea generation and testing. Lean product development was selected because it presents a rather holistic approach to product development. Agile software development focuses on product implementation but also covers important aspects that relate to testing ideas on the market.

2. As the research questions also address enabling factors that support innovation within an enterprise, the reviewed concepts need to deal with these aspects as well. Lean product development and agile software development clearly fulfil these criteria as these concepts cover preconditions in enterprises for successful product development. Business model design also offers a broad perspective by discussing aspects such as cost structures and key resources, which are neglected by other concepts.
3. Thirdly, concepts need to cover both the technical as well as the business perspective on product development. As the focus of this thesis lies on telecommunications products where software development is an essential part of product development, agile software development is chosen to cover the technical aspects. Design thinking and business model design are chosen because these concepts discuss business related aspects of product development. Lean product development complements this analysis because it combines both technical and business issues.

This chapter begins by discussing concepts relating to the innovation process itself. Subsequently, it turns to design-centric and lean concepts for product development that focus on experimentation, iterative development and a fast time-to-market. Finally, approaches originating in the areas of software development are discussed.

2.1 The Open Innovation Process

The traditional innovation process, in which companies are exclusively responsible for new product ideas and for deciding which products should ultimately be marketed is increasingly challenged by innovation management academics and practitioners alike. (Fuchs and Schreier 2011) Contrasting this classical, vertically integrated innovation model, open innovation assumes that corporate innovation activities resemble an open system with actors within and outside of the company. Chesbrough and Bogers (cited in West et al., 2014) define open innovation as “a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization’s business model.”

Contrasting the principles of closed and open innovation shows that open innovation integrates actors, ideas and capabilities from outside the organization into the product development process.

Closed Innovation Principles	Open Innovation Principles
The smart people in our field work for us.	Not all of the smart people work for us so we must find and tap into the knowledge and expertise of bright individuals outside our company.
To profit from R&D, we must discover, develop and ship it	External R&D can create significant value; internal R&D is needed to ourselves claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research in order to profit from it.
If we are the first to commercialize an innovation, we will win.	Building a better business model is better than getting to market first.
If we create the most and best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our intellectual property (IP) so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

Table 1 Contrasting Principles of Closed and Open Innovation (Chesbrough, 2003)

In an open innovation process, customers have a particularly strong stake in the development of products. According to Fuchs and Schreier (2011), customers can be integrated into the innovation process via two basic dimensions: Firstly, they can provide ideas for new product designs and secondly they can participate in the selection of product designs to be produced. Integrating customers in the product development process results in increased levels of perceived customer orientation and a higher likeliness to choose products from a given company. Firms can therefore improve the outcome of their innovation process and increase the acceptance of the product on the market as well as improve their reputation as a customer oriented firm. (Fuchs and Schreier 2011)

Among the customers of a firm, lead users are a particularly valuable source of innovative product ideas. "Lead users are defined as members of a user population who (1) anticipate obtaining relatively high benefits from obtaining a solution to their needs and so may innovate and (2) are at the leading edge of important trends in a marketplace under study and so are currently experiencing needs that will later be experienced by many users in that marketplace." (von Hippel 1986 cited in Franke et al. 2006)

Proving the validity of the lead user theory, Urban and von Hippel (1988) have found that 82 percent of lead users in their study have developed their own versions of the product or had modified a specific type of product. In contrast, only 1 percent of the non-lead users showed a similar behaviour. These findings led to the conclusion that lead users would be best

positioned to understand what will be needed by many at a later point in time as their present-day needs already reflect future market demand. (Franke et al. 2006)

The literature on open innovation and the lead user concept shows that opening the innovation process to external input is essential for improving the quality of products from the perspective of the customer. Therefore, both concepts provide valuable input for the agile innovation model.

2.2 Design-Centric Approaches: Design Thinking and Business Model Design

Since the beginning of the 2000s, design-centric approaches to product development have gained popularity. The term was coined by Tim Brown, CEO of IDEO, who defined design thinking as "a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity." (Brown 2008)

According to Brown, designers assume a new and enhanced role in the process of creating new products: "Rather than asking designers to make an already developed idea more attractive to consumers, companies are asking them to create ideas that better meet consumers' needs and desires." (Brown 2008) Hence, designers and methods related to the design process assume a more strategic role in product development and significantly contribute to value creation. Design principles cannot be just applied to physical products, but also to consumer experiences, to production and interaction processes, and to improvements that make existing products more appealing or functional. (Brown 2008)

Generally, design thinking is not a linear process. Rather than following a pre-defined sequence of process steps, design projects pass through three phases: inspiration, ideation and implementation. During the "inspiration" phase, designers look at the circumstances that motivate the search for solutions. "Ideation" is the process of generating, developing and testing ideas. Finally, the "implementation" phase describes the path to the market. Most importantly, projects will iterate through these spaces (particularly the first two) as ideas are refined. (Brown 2008)

With its strong focus on idea generation, design thinking is part of the fuzzy front end of innovation but it also challenges the product development process itself: In addition to "thinking" it also emphasizes "making", i.e. the prototyping of ideas which is expected to validate ideas and support idea generation. (Cooper et al. 2009) By emphasizing testing and

implementation, design thinking doesn't limit its focus to designing the product itself but looks at a wider range of aspects that help making the product successful in the market. However, an even more structured approach to these aspects is presented by business model design, which looks at issues such as revenue flows, distribution channels and partners that complement the value proposition. Therefore, a business model is not only a value proposition, a revenue model, or the combination of resources of a firm, it is a holistic concept that combines all of these elements. Figure 1 illustrates the core elements of a business model.

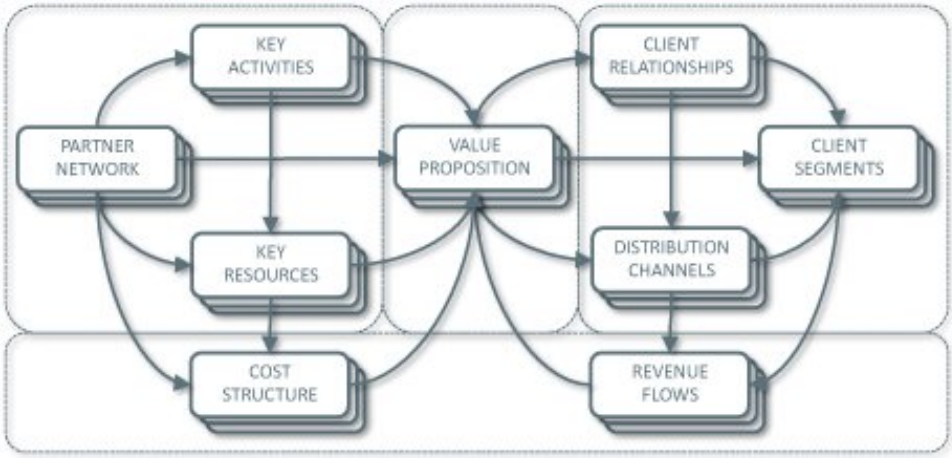

Figure 1 Osterwalder's 9 Point Decomposition of a Business Model (Osterwalder 2005, cited by Chesbrough 2010)

Zott et al. (2011) identify two complementary ideas that are addressed in the in the research on business models. Firstly, companies commercialize innovative ideas and technologies through their business models. In this case, a business model is mainly seen as a mechanism that connects a firm's innovative technology to customer needs and to the other resources of the firm (e.g. complementary assets). The second approach is that the business model itself represents a new subject of innovation, which complements the traditional subjects of process, product, and organizational innovation. This view extends the traditional concept of business models and involves the design of new forms of cooperation and collaboration that enable value creation. Therefore, it is crucial for firms to develop the capability to innovate their business models just like their products and technologies. Still, while companies have invested in processes for exploring new ideas and technologies, they often have little if any ability to innovate their business models. (Chesbrough 2010)

New and potentially disruptive business models face resistance from within the organization. They often conflict with more traditional configurations of firm assets, whose managers are likely to resist experiments that might threaten their own position in the company.

(Chesbrough 2010) In addition to these conflicts with prevailing business models, it is often very unclear what an alternative and disruptive business model might be in the first place. Therefore, it is crucial to undertake active tests to probe nascent markets with new potential configurations of the elements of a business model. (Chesbrough 2010)

Both design thinking and business model design are holistic concepts that aim at turning ideas into sustainable business opportunities. Design thinking describes a phased approach to product development (inspiration - ideation - implement) and focuses on customer involvement and testing ideas on the market. Business model design focuses on the combination of different elements that complement the value proposition and therefore provides an analytical base for developing new business models. Hence, both concepts can be used to develop the agile innovation model

2.3 Lean Product Development

Similar to design thinking, lean approaches to product development also strongly favour iterative methods over traditional linear processes. Steve Blank and Eric Ries describe methods to develop business models and build up new companies ("Lean Startup") and how to integrate these approaches in the context of an existing firm ("Lean Enterprise").

Both the lean startup and the lean enterprise are inspired by lean manufacturing concepts developed at Toyota. Lean thinking radically alters the way supply chains and product systems are run by focussing on the knowledge and creativity of individual workers, the shrinking of batch sizes, just-in-time production and inventory control and an acceleration of cycle times. (Ries 2011) In this respect, it is a stark contrast to classical western systems of production that have their roots in the Taylorist tradition of linear processes, high division of labour and tight management control.

The lean startup concept is based on experimentation and an iterative approach: Instead of developing the business plan upfront and implementing all the features of a product before launching it on the market, the proposition is tested with a small number of customers and then gradually refined. In this process, there is sufficient room for modifying the business model as customer feedback comes in and the proposition is adapted. (Ries 2011)

The lean startup approach has three key principles: Firstly, entrepreneurs summarize their hypotheses in a business model canvas creating a diagram of how a company creates value for itself and its customers. Secondly, startups use an approach called customer development to test their hypotheses. In this phase, they focus on direct, personal contact with potential

customers or other partners in the value chain to obtain feedback on all elements of the business model, including product features, pricing, distribution channels or customer acquisition strategies. (Blank 2013) After every test, they adapt their product and re-test a redesigned offering to validate their hypotheses.

Thirdly, startups employ agile development, a practice that originated in the software industry. Agile development complements customer development by providing methods to frequently release new version of a software product and incorporate customer feedback efficiently. (Blank 2013)

Humble et al. (2015) further developed the concept of the lean startup and applied it to enterprises in general. They particularly focus on factors that enable the integration of lean and agile practices in the context of established organizations. Their size and their organizational structures, processes and existing strategies put established organizations at a disadvantage compared to newly created firms which makes it challenging for them to take a leaner approach to product development.

In this discussion, Humble et al. (2015) address several areas of corporate governance that need to be aligned with the goals of lean product development. Firstly, culture is the most critical factor in an organization's ability to adapt to a changing environment. Creating an organizational culture in which it is safe to run experiments and fail is a key success factor for lean product development. Secondly, Humble et al. (2015) identify the innate mindset of employees as another factor that strongly impacts their ability to learn new skills. They distinguish between a fixed and a growth mindset: In a fixed mindset, employees believe that abilities and intelligence are fixed traits and cannot be altered. In a growth mindset, employees believe that their skills can develop through effort. In an environment with changing requirements and a high need to adapt, companies must hire for a growth mindset instead of existing experience and the ability to execute. (Humble et al. 2015)

Finally, they also discuss governance, risk management and compliance processes (GRC) of established firms and their need for adaption to lean principles. Governance is defined as the responsibilities and accountability of members of the organization, risk management deals with the exposure of the organization to unpleasant events and compliance relates to the obedience to law or industry regulations. (Humble et al. 2015) In large enterprises, these functions are designed to provide control and stability and generally find it hard to deal with the uncertainties of testing new business models and iterative practices.

Among the concepts reviewed in this chapter, lean product development provides the broadest perspective on iterative product development within established organizations. In particular, the discussion on enabling factors contributes to the development of the agile innovation model.

2.4 Agile Software Development

Within the context of the product development process, agile software development mainly deals with the implementation of products. The origins of agile software development models date back to late 1980s and early 1990s. (Kettunen 2009) Since then, a variety of agile software development methods have emerged, that address the need of developing software quickly, in an environment of rapid changing requirements.

Erickson and Lyytinen (2005) define agility as a way to "strip away as much of the heaviness, commonly associated with traditional software-development methodologies, as possible to promote quick response to changing environments, changes in user requirements, accelerated project deadlines and the like." Agile software development methods therefore compensate for the lack of responsiveness to changing environments that traditional methods have shown in the past. Additionally, Chan and Thong (2009) stress that agile methodologies emphasize individual competence, constant communication and close collaboration between developers and customers.

In contrast to traditional software development methods that strongly focus upon planning and process control, agile software development methods present a lighter approach to software development. It accepts the lack of stable requirements and uses small self-managed teams to frequently produce reliable software that meets customer requirements. Examples of agile methodologies include Extreme Programming, Scrum or Crystal. (Hayes and Richardson 2008, Lindstrom and Jeffries 2004)

In general, their basic premise is that a small, co-located team working closely together with the customer can create a high- value product cost-effectively with frequent short iterations. (Kettunen 2009) Rather than describing these methods individually, the following section focuses on three commonalities of these methods that particularly enable agile innovation: (1) the cooperation between software developers and business representatives, (2) their approach to planning and changing requirements and (3) releasing new software iteratively and in small batches.

Cooperation between software developers and business representatives

Close cooperation between business representatives and software developers lies at the heat of agile methodologies. Agile software development teams are cross-functional and alongside developers and testers, customers (i.e. representatives of business departments) are a central part of the team. (Lindstrom and Jeffries 2004) To keep the methodology simple, most of the literature on agile software development describes the business representatives as a single person who represents the requirements, acceptance criteria, and business value for the project. The Scrum methodology, for examples, calls this role "product owner". However, in practice, there is usually a team of business representatives that might even be larger than the software development team itself. This is especially common in large or complex projects that involve multiple business departments. In this case, teams face considerable challenges such as communicating with and balancing the needs of multiple stakeholders, prioritizing features and providing sufficient feedback to ensure that the implemented features achieve the stakeholder's goals. To address these challenges, customer teams might be assisted by analysts, testers, and coaches, who facilitate the process. (Lindstrom and Jeffries 2004)

To further improve the cooperation between developers and business representatives, agile methodologies recommend co-location of team members. This facilitates communication, helps creating a shared understanding of the problem to be solved and ensures quick clarification of open issues between developers and business representatives. (Hosbond and Nielsen 2008) Open workspaces and shared project rooms act as centres of communication and meeting points for team members with diverse backgrounds.

Planning

Agile software development focuses on adaptive planning with frequent feedback loops. In agile software development, planning is typically conducted at two levels: Release planning and iteration planning. During release planning, customers present their desired features to the programmers, and the programmers conduct cost estimates based on their complexity. Initial estimates will necessarily be imprecise, but will gradually be refined as the team progresses. Iteration planning represents a finer level of planning. Again, customers present their requirements and developers estimate costs, however, this is done for a two-week period and thereby refines release planning. (Lindstrom and Jeffries 2004)

Agile software development methods such as Extreme Programming or Scrum do not assume that all business requirements can be articulated upfront by the customer. If the need for additional features emerges later in the development process, the methods accepts that these

functionalities can be added to the feature list at any point in time. Therefore developers do not have to be concerned with unarticulated customer requirements, thus avoiding over-engineering of software systems. This represents a vast departure from the traditional software-development process, in which all requirements must be specified up front. (Erickson and Lyytinen 2005)

Release in small batches (iterations)

Releasing newly developed software frequently and in small batches is the logical consequence of close customer collaboration and iterative planning. Each iteration delivers fully developed and tested software that meets the acceptance criteria of customers. To enable this, testing is automated and integrated into every iteration. This practice assures that working software is delivered at the end of each cycle. Even between cycles, development teams keep the system integrated and running all the time. This practice is called continuous integration and increases software quality because frequent integration enables the rapid detection of faulty parts of software. (Lindstrom and Jeffries 2004)

Finally, feedback is an essential part of each iteration. After each iteration, the team does a short reflection on what went well during the present cycle and what should be improved. After a release of the product, a more in-depth retrospective is performed on the whole project. (Lindstrom and Jeffries 2004)

In sum, agile software development methodologies stress the importance of the customers as a provider of information regarding requirements and priorities and accept that customer teams face challenges in coming up with this information. However, given their focus on software development, they do not provide methods on how to answer these questions from a business perspective. How are ideas generated, selected, defined and later reformulated as tasks on a product backlog or feature list? These questions are important in an innovation process and especially in bridging the business aspects of innovation with agile software development. (Hosbond and Nielsen 2008)

3 The Agile Innovation Model

The agile innovation model describes the components that are necessary to develop new and innovative products within an enterprise using lean and agile methods. It synthesizes the concepts discussed in chapter 2 to draw a holistic picture of (1) the innovation process itself and (2) the necessary enabling conditions for its adoption in an enterprise. Thus, the agile innovation model provides a conceptual framework that describes methods and tools used for the development of innovative products. In the description of the model in this chapter, the focus is placed on the concrete methods and tools that support each element.

3.1 Overview of the Model

In the context of this thesis, agile innovation is defined as the development of innovative products or services with a high degree of uncertainty and ambiguity along several dimensions: (1) the exact solution to an identified customer problem is unknown (the problem-solution-fit is not clear), (2) the size and characteristics of the market are unknown (the product-market-fit is not clear), (3) the business model is untested and diverges from the existing business model of the organization and (4) iterative and agile product development methods are used to solve design problems and implement the solution.

Chapter 2 provides the basis for the development of the model. The extant literature shows that there are concepts, which concisely describe methods relating to individual parts of the innovation process. Additionally, several models address challenges that lie outside of the innovation process itself and relate to governance issues that are in place in established organizations. However, the specific focus of each of these models makes it necessary to combine them in order to arrive at a holistic description of an agile product development model for established firms:

- Open innovation and the lead user concept are generic, industry-neural approaches that focus on idea generation and testing prototypes on the market. However, these

concepts lack a discussion on facilitating factors within the enterprise and neglect methods relating to the technical implementation of products.

- Design thinking and business model design focus on product design but also address a broader range of topics that facilitate the development of innovative products. Again, no focus is placed on technical implementation.
- Lean product development provides a holistic description of an iterative innovation process (the lean startup) and additionally puts product development into the context of an established enterprise. However, idea generation and structured customer involvement is not discussed.
- Finally, agile software development covers the technical implementation of software products. In addition, it touches upon enabling factors that facilitate their use within an enterprise. Just like lean product development, it does not deal with idea generation.

The agile innovation model (see Figure 2) combines concrete methods that originate from the above-mentioned concepts. It describes the phases of the core product development process and adds several elements that act as enablers to anchor this process successfully within an enterprise. The three core phases (design, test, accelerate) employ iterative and experimental methods and tools to develop a new business model with all of the relevant components. The enabling elements (portfolio management, financial management, metrics, governance-risk-compliance, team management and culture) are not agile per se, but support the implementation of agile product development methods.

The remainder of this chapter outlines the core methods, tools and guidelines used to implement each of these elements.

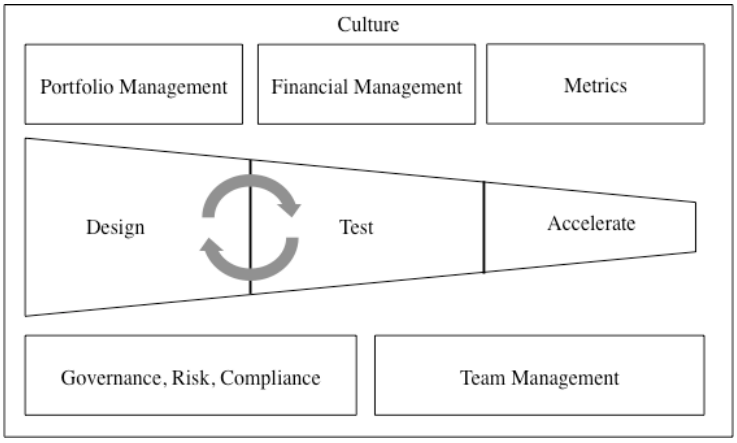

Figure 2 The Agile Innovation Model

3.2 Core Elements

The core elements of the agile innovation model build upon concepts discussed in chapter 2 and combine methods and practices of design thinking, lean startups, business model development, value proposition design, open innovation and agile software development. As described by Osterwalder (2014) and Humble et al. (2015), there is a logical sequence of elements in the core innovation process: (1) design, (2) test, (3) accelerate. The design phase deals with generating product ideas and sketching the business model. The testing phase establishes a problem-solution-fit and then iterates the business model to establish a product-market-fit. (Ries 2011) Finally, in the accelerate phase the new business model is exploited on a broader scale and the new product is anchored in the organization.

3.2.1 Design

The design phase lays the foundation for product development. Initially, product ideas are generated and subsequently they are described and refined to provide a basis for testing. There are multiple tools that can be used in this phase. For the purpose of this thesis, the lead user method and ethnographic research were selected because they provide a framework for integrating customers in product development in a structured way. Afterwards, tools such as customer profiles and the business model canvas helps with detailing the initial product ideas with a strong focus on the fit between customer needs and product features. In addition, the business model canvas provides a framework for analysis that is particularly valuable for innovative products that should adapt or extend a firm's current business model.

Idea generation

Idea generation is the first step in the design phase. There is a large variety of tools that may provide input for this phase, such as consumer trend analysis, in-house idea suggestion systems or working with external partner and suppliers. As new products and services ultimately have to solve customer's problems, working with (potential) customers or users at some stage of the innovation process has proven successful with many innovation projects. (Lüthje and Herstatt 2004) Two of the methods frequently discussed in the relevant literature are lead user workshops and ethnographic research. The following section provides a brief overview of the essential elements of both methods.

As illustrated in Figure 3, Lüthje and Herstatt (2004) recommend a multi stage approach when working with lead users.

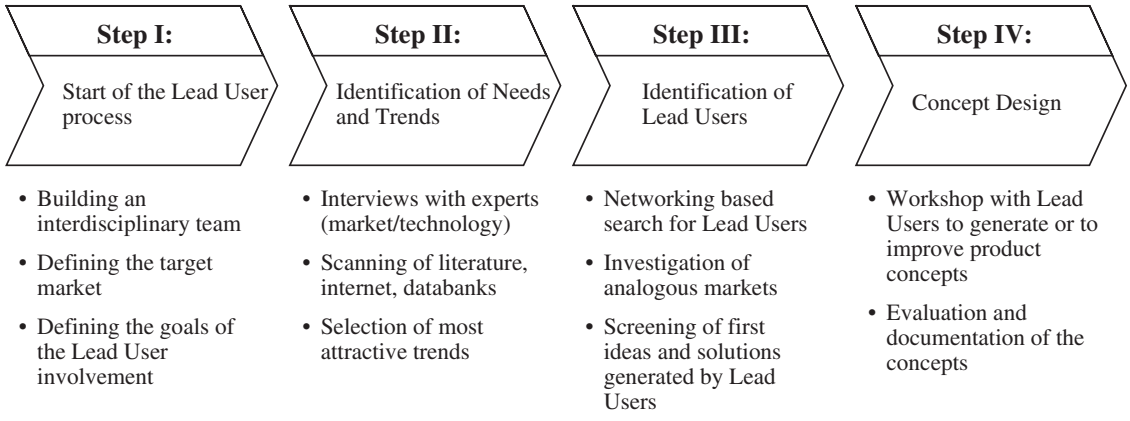

Figure 3 The Process of the Lead User Method (Lüthje and Herstatt 2004)

After preparatory work with internal experts and initial data collection, lead user themselves are involved in step 3 and 4 of the process. When identifying lead users (step 3), it is worth extending the search to problem solvers who don't have experience in a particular target market but face similar problems in other markets (distant analogous markets). Franke et al. (2016) have shown that although solutions provided by lead users from analogous markets show lower potential for immediate use, they demonstrate substantially higher levels of novelty. Lead user can contribute to concept design (step 4) in two ways: either they are interviewed individually or participate in a 2-3 day workshop together with other lead users. As conducting face-to-face workshops is associated with a considerable investment of human and financial resources from both the company and the lead users, the most suitable approach for each innovation project must be discussed individually. (Lüthje and Herstatt 2004)

Complementary to the lead user method, the field of ethnography provides a range of research methods that can be used to understand customer needs and receive input for innovative products and services. Ethnographic research such as interviews or customer observations may reveal design opportunities, which are not obvious at the beginning and represent unconscious concerns or desires of the consumer. (Rosenthal and Capper 2006) The practice of interviewing (potential) customers to gain insights about their needs is well established, but might lead to distorted results if customers act differently than they indicated in the interview. Observing customers in the real world is an intensive ethnographic approach where observers acquire first-hand experience of a target group by joining customers in relevant activities. (Rosenthal and Capper 2006) Observations in home or workplace settings allow researchers to observe behaviour and other evidence the respondent may not have otherwise believed to be relevant. Additionally, product designers get a more in-depth understanding of the attitudes and values of the customer that helps creating a product, which resonates with the customer's

personality, taste or lifestyle. Both in-depth interviews and customer observations deal with small, carefully screened samples of the potential or target customer domain. (Rosenthal and Capper 2006)

Describing and refining ideas

Based on the information collected in the previous phase and the product ideas generated from it, it is crucial to arrive at a shared understanding of the needs and wants of the customer group, the description of the product or service to be designed and the business model that it is embedded in. According to Osterwalder (2014) the following tools help to gain this common understanding: (1) customer profile, (2) value map and (3) business model canvas. The customer profile (see right side of Figure 4) describes customer jobs (i.e. tasks a customer is trying to complete), customer gains (i.e. outcomes and benefits desired by customers) and customer pains (i.e. risks or potential negative outcomes). The value map (see left side of Figure 4) draws a holistic picture of the value that is generated for customers by describing the value proposition itself, the factors that contribute to solving customer problems (pain relievers) and the factors that generate benefits for customers (gain creators). Creating a fit between the customer profile and the value map is essential for successful value proposition design. (Osterwalder 2014)

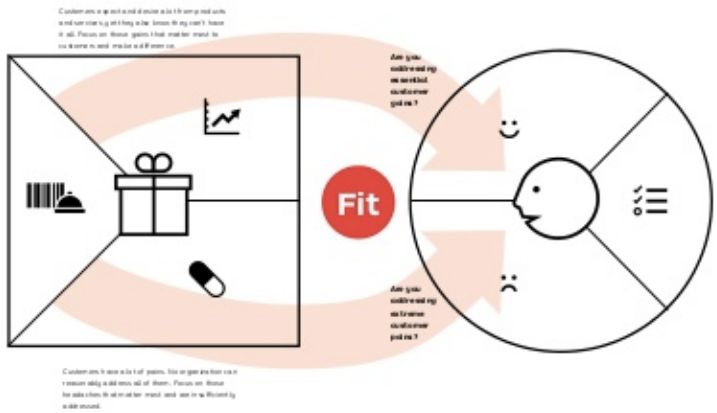

Figure 4 Establishing a Fit between Value Map and Customer Profile (Osterwalder 2014)

Subsequently, it is essential to fit the value proposition design into a business model that creates value for the firm. The business model canvas illustrated in Figure 5 was developed by Osterwalder (2014) and helps to design business models by describing all elements of a business model and their interconnections. In the design phase of an innovation process, hypotheses about the various elements of the business model are formulated, which are reflected in the business model canvas.

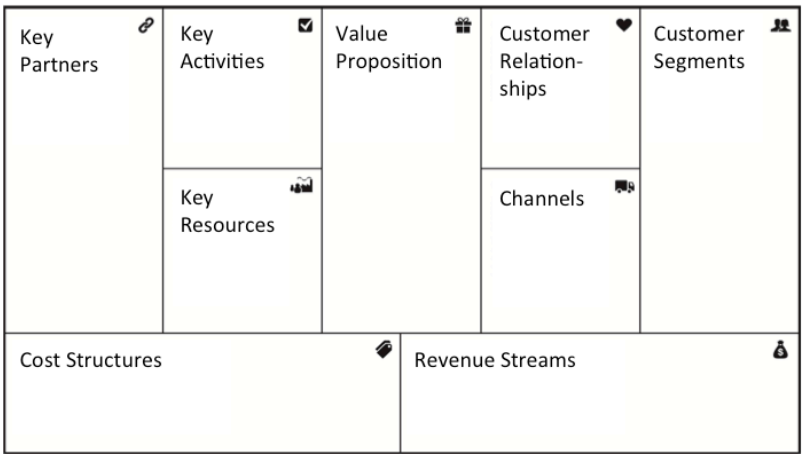

Figure 5 Business Model Canvas (Osterwalder 2014)

Rather than answering the question "Can we build this product?" the business model canvas is expected to provide an answer to the questions "Should this product be built?" and "Can we build a sustainable business model around this set of products and services?". (Ries 2013) By including a design of the business model in the innovation process, the agile innovation model adopts the view described by Zott et al. (2011) that business models themselves represent a subject of innovation.

In terms of intra-organizational communication, the business model canvas and the value proposition canvas have an additional positive side-effect: they create alignment between different stakeholders in the organization by helping to communicate which customer jobs, pains and gains the innovation project focuses on and how the product or service to be designed will address them. (Osterwalder 2014)

3.2.2 Test

Testing and experimentation with customers is an essential part of agile product development. Therefore, product concepts developed in the design phase need to be validated as quickly as possible with potential customers. In his lean startup model, Ries (2014) calls this "validated learning" which is defined as "the process of demonstrating empirically that a team has discovered valuable truths about a startup's present and future business prospects."

Therefore, a key aspect of the testing phase is the iterative evolution of the initial value proposition and business model that was developed during the design phase. Osterwalder (2014) warns of "falling in love" with early ideas, because they are certain to transform radically during prototyping. Experimentation, adaptation and the management of this change process are necessary to progressively reduce risk and uncertainty.

For innovative products and services that change or extend the current business model of a given firm, it is crucial to design experiments that address the most important hypotheses that need to be valid for the business model to work. Product developers are frequently focused on testing products and services without providing evidence that the overall business model is profitable. (Osterwalder 2014)

The testing process itself is performed in several steps: The formulated hypotheses are prioritized according to relevance for the business model. Subsequently tests are designed and run and finally learnings are captured. When designing tests, it is crucial to produce evidence with a call to action: The more a customer has to invest to perform a call to action, the stronger the evidence of interest. Clicking a button, answering a survey, providing a personal e-mail, or making a pre-purchase are different levels of investments and tests should be selected accordingly to test a customer's interest, preferences or willingness to pay. (Osterwalder 2014)

Thomke and Reinertsen (2012) stress that experimenting with many diverse ideas is crucial to innovation projects. However, it is important to note that experiments resulting in failures are not necessarily failed experiments. Failures can be desirable because they allow teams to eliminate poor options quickly and focus on more promising alternatives. The faster the experimentation cycle, the more feedback can be gathered and incorporated into new rounds of experiments.

Customer involvement in the testing phase is key to producing credible evidence about the hypotheses of the business model. All models discussed in chapter 2 advocate for some kind of customer involvement, the most common being testing hypotheses with the help of different kinds of prototypes. Osterwalder (2014) defines prototyping as "the practice of building quick, inexpensive, and rough study models to learn about the desirability, feasibility, and viability of alternative value propositions and business models." Figure 6 shows that prototypes vary depending on the ambiguity of ideas and how far a project is into the development and testing process. (University of St. Gallen 2016)

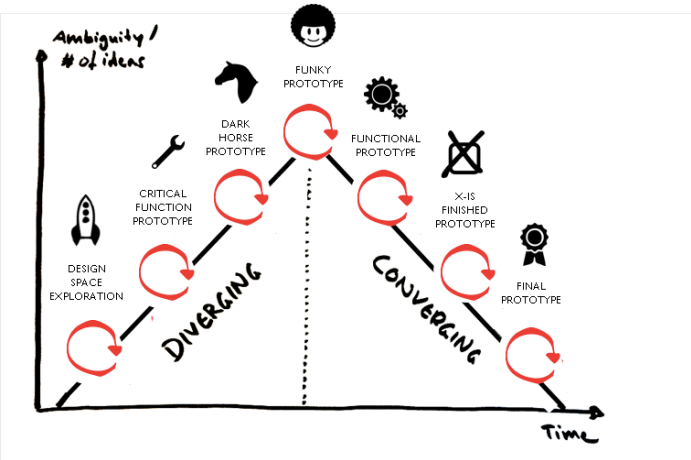

Figure 6: Phases of the Design Thinking Process (University of St. Gallen 2005)

A particular prototype cited in the relevant literature is the minimal viable product (MVP). Its goal is to test the fundamental business hypotheses that were initially formulated. An MVP can take many different forms such as a low-fidelity prototype, a beta-version of a product or even just a smoke test where concepts are validated with customers only using marketing collateral. In any case, a minimum viable product (MVP) helps entrepreneurs to start the process of learning as quickly as possible. (Ries 2011) Moogk (2012) identifies two essential qualities of an MVP: firstly, it should only have the minimal set of features and secondly, it must be able to measures the product's traction in the market. The latter criterion is especially important, as product designers need to evaluate the real business impact of a product and not simply produce "feel-good results". Measuring only the number of newly acquired customers instead of recurring and churning customers is one example of this kind of "vanity metrics". (Ries 2011)

At the end of a successful testing phase, the team reaches a "product-market-fit" (Osterwalder 2014). The key hypotheses about the customer, the value proposition and the business model are validated and the team can move on to accelerate growth in the selected market.

3.2.3 Accelerate

The third phase of the innovation process aims at developing a fully-fledged product quickly and efficiently and enhancing it continuously. In this phase, agile software development methodologies can be used to achieve these goals. As discussed in chapter 2, different agile software development methods share a focus on cooperation between software developers and customers, adaptive planning and iterative releases in small batches. One of the best-known agile software development methods is Scrum. Scrum-based software development also

requires close alignment between development departments and IT-operations. Therefore, the concept of continuous integration and delivery complements this section.

Scrum

Scrum is a software development method that focuses on project management in situations with a high degree of uncertainty in terms of business requirements. Therefore, scrum provides mechanisms that enable quick feedback and brings decision-making authority to the level of operational teams. In projects using scrum, software is developed by a self-managing team in increments, called "sprints" that start with planning and end with a review. (Li et al. 2010)

Instead of combining fixed sets of business requirements into projects, scrum uses feature backlogs to manage and prioritize requirements. When new features were proposed, they are quickly categorized, causing the backlog to be reprioritized. When development capacity becomes available, the highest priority feature is pulled from the list. (Humble et al. 2015) Figure 7 illustrates the basic phases of a Scrum project and the use of feature backlogs in both product planning and sprint planning.

Figure 7 Phases of a Scum Project (Scrum Alliance 2016)

To prioritize features within the backlog, Humble et al. (2015) propose the cost of delay method, which estimates the value of a feature by calculating how much money would be lost by not having the feature available when needed. Using this approach, the impact of time on value can be determined and decisions can be made on an economic basis.

To manage the workflow and track progress, scrum methods are frequently combined with kanban boards and burndown charts. Kanban boards (see Figure 8) visualize the state of features of the current spring and groups them in categories along the development process (i.e. "not started", "in analysis", "in development" or "deployed"). Thereby it visualizes workflows and limits the work in progress (Humble et al. 2015)

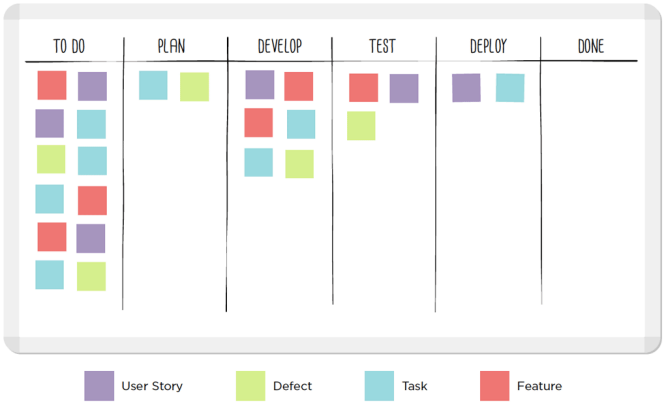

Figure 8 Kanban Board (Humble et al. 2015)

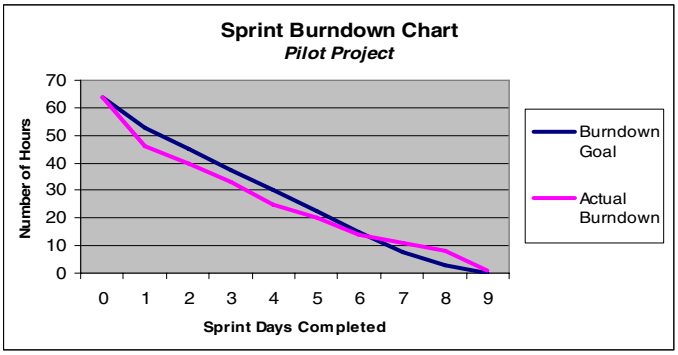

Figure 9 Sprint Burndown Chart (Hayes and Richardson 2008)

Burndown charts (see Figure 9) are visual representations of the total backlog and progress made against that backlog over time. By extrapolating the lines of the chart, it allows for a quick visual analysis of project completion. (Karlesky and Vander Voord 2008)

Continuous Integration and Delivery

For agile product development to be successful, new versions of a product need to be released quickly and frequently to the market in order to be tested by customers. Humble et al. (2015) define continuous integration as the practice of working in small batches and using automated tests to detect and reject changes that impair software quality. This practices contrast traditional approaches that involve long development times, extensive testing and integration as well as complex deployment of large releases. Additionally, it represents a low-cost and low-risk approach to running experiments during the design and test phase.

Deploying continuously and frequently entails substantial changes in the ways in which development teams work. It also blurs the lines between development and operations because it gives team members generous access to technical environments in all phases of the development process. (Humble et al. 2015) Due to these fundamental differences to

traditional software development processes, adopting continuous integration also requires a culture based on trust and cooperation, as discussed in chapter 3.3.6.

3.3 Supporting Elements

The supporting elements of the agile innovation model facilitate the integration of the core elements into the context of a large enterprise. In particular, the concepts of lean product development and agile software development provide valuable inputs for this analysis. They are combined into a holistic description of the enabling factors that facilitate both the planning and execution of innovative product development projects within an enterprise in all phases of its lifecycle: Portfolio management and financial management need to be adapted to free resources for innovative projects and prioritize them accordingly. Furthermore, companies need to rethink how they measure the success of these projects. Next, governance and risk management processes as well as compliance guidelines need to be redesigned to reflect the iterative nature of agile projects. And finally, team management and cultural issue need to be considered as well, because agile product development methods focus on close cooperation within small project teams. They are ideally supported by a corporate culture that facilitates experimentation. The following sections briefly highlight some of the shortcomings of approaches frequently used in established enterprises and offer alternatives that better support agile product development.

3.3.1 Portfolio Planning

Establishing a balanced innovation portfolio is a key prerequisite for any successful innovation strategy. According to Day (2007), improvements or minor innovations make up 85 to 90 percent of companies' development portfolios, but they rarely generate the growth companies seek. The "Big I"-projects, as Day calls them, push the firm into adjacent markets or novel technologies and can generate the profits needed to close the gap between revenue forecasts and growth goals. However, these projects are frequently perceived as being inherently risky in nature, as the financial returns cannot be predicted with a high degree of certainty using established financial methods such as discounted cash flow. Particularly with respect to disruptive innovation, Chesbrough (2010) notes that gross margins are initially far below those of the established products and services. As firms allocate their capital to the most profitable projects, established technologies and improvements of existing products will be disproportionately favoured and disruptive innovations are likely to be neglected. The

following section describes tools and methods that help with managing three essential aspects of a well-balanced project portfolio: time, risk and internal capacities.

Managing Time Horizons

Baghai (1999 cited in Humble et al. 2015) proposes a three-horizon model to describe business opportunities and the time horizons in which revenues from these opportunities materialize. As illustrated in Figure 10, horizon 1 consists of a set of core products that deliver results in the same year and typically build on the improvement of existing products. Horizon 2 projects represent emerging business opportunities that require significant investment and the attention of sales and marketing divisions to succeed, but will not deliver the same levels of returns as horizon 1 investments. Innovation projects with new business models that aim at new markets or new customer segments are typically found in horizon 3. In the design and test phase, innovative product development project are assigned to horizon 3 and as soon as a product-market-fit has been found, they move to horizon 2.

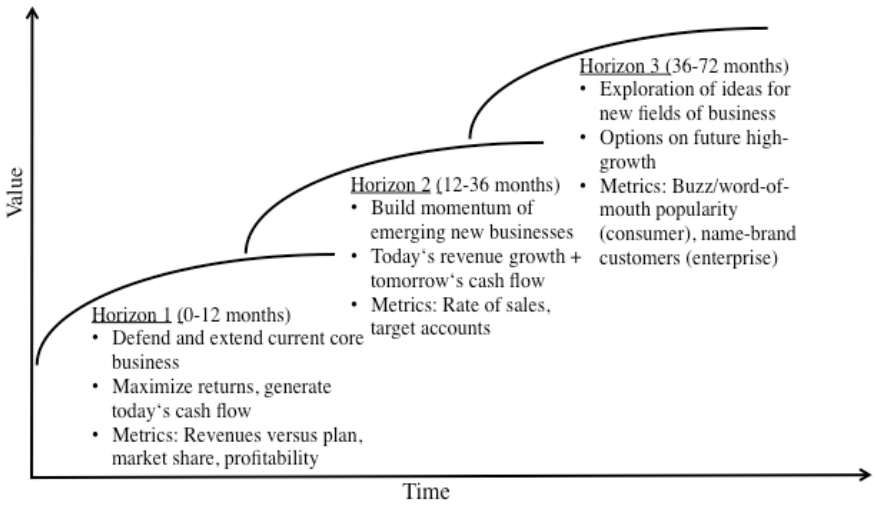

Figure 10 Three Horizons of Growth (adapted from Humble et al. 2015)

Distinguishing between these three horizons of growth is crucial for innovative product development projects because their existence is frequently threatened in established firms: Firstly, they require substantial investment without delivering immediate revenues, secondly they require different product development methods and tools and thirdly, there is a tendency in profitable enterprises to shy away from cannibalizing profits and market shares by investing in disruptive new products. (Humble et al. 2015)

Managing Risk

The risk matrix complements the 3-horizon-model by helping to assess the degree of uncertainty of a given project. It creates a visual starting point for an ongoing dialogue about

the company's mix of projects and their fit with strategy and risk tolerance. (Day 2007) The logic of the risk matrix in Figure 11 stipulates that the less familiar the intended market (x-axis) and the product or technology (y-axis), the higher the risk. Incremental improvements that aim at the company's current markets fall in the bottom left of the matrix, whereas the more innovative products targeting new markets are shown on the upper right. The size of each dot is proportional to the project's estimated revenues. However, products in the upper right corner also reveal a higher probability of failure (defined as not reaching expected profitability goals). (Day 2007)

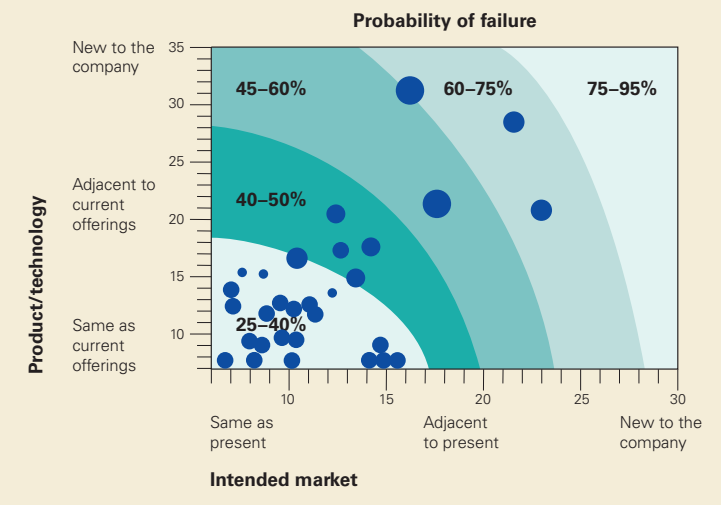

Figure 11 The Risk Matrix (Day 2007)

According to Day (2007) a typical analysis reveals two things: a company has more projects than it can manage well, and the distribution of projects is skewed towards incremental innovations. With the help of the risk matrix, a company can adapt its portfolio towards increasing the proportion of major innovations while carefully managing risks.

Managing Capacity

As discussed above, the risk matrix typically shows that most companies have more projects than they can manage well, resulting in chronically understaffed projects and multi-tasking employees. Managers intuitively use their resources to full capacity assuming that if people don't work 100 percent of their time, projects take longer. However, Thomke and Reinertsen (2012) argue that processes such as product development behave very differently. When partially completed work needs to wait for resources to become available, the duration of the overall project will grow. Queues also delay feedback, causing developers to follow unproductive paths for longer.

Obviously, one solution to such problems is to provide extra capacity in processes that are highly variable. 3M, for example, plans 85 percent of their product developers' capacity and Google is famous for its "20 percent rule" allowing engineers to work on personal projects one day a week. In practice, this means that this extra capacity becomes available when a project falls behind schedule. (Thomke and Reinertsen 2012)

3.3.2 Financial Management

As discussed in chapter 3.3.1, without appropriate portfolio planning, innovation projects always risk being rejected in favour of projects that implement incremental improvements and provide immediate return on investment. The same applies to funding these initiatives, which needs to be closely aligned with portfolio planning. A separate budget helps to avoid competition between new initiatives and projects that support the established business of the firm. (McGrath 2013) Even more than a separate innovation budget, flexible budgeting cycles are crucial for funding successful innovations.

"Beyond Budgeting", a term coined by Jeremy Hope and Robin Fraser, presents an alternative to traditional annual budgeting. It takes the budgeting process as a starting point to transform an enterprise away from a central command-and-control structure towards a more adaptive financial planning system that relies on the self-governance of independent units. In terms of values and guidelines, this practice is clearly in line with the agile innovation concepts discussed in this chapter, particularly relating to transferring decision-making authority to project teams. Companies such as Handelsbanken in Sweden or IKEA have transferred power from central units to operating managers and their teams, giving them budgetary leeway and the authority to achieve results without being constrained by a specific annual budget plan or agreement. (Hope and Fraser 2003) Strict annual budgets are replaced with high-level long-terms goals and a constant adjustment of shorter-range plans in order to achieve these targets. In terms of processes, practical lightweight ways to approve small block of additional funding for innovative projects need to be established, however, transparent monitoring needs to assure that the organization is disciplined about stopping projects that don't generate the expected results. (Humble et al. 2015)

With its focus on decentralized decision-making and a shift of responsibility to the operations level, this approach supports experimentation and iterative development of products. Just like agile software development practices, it shifts the locus of decision making to the operational level and enables fast response times and quick adaptation of plans and customer outcomes.

3.3.3 Metrics

As discussed above, success metrics for innovation projects are closely related to portfolio decisions and allocation of financial resources. In a highly uncertain market environment, conventional metrics can effectively kill innovations by imposing decision criteria that are unfit to measure the success or progress of an innovation project. The net present value rule, for instance, assumes that every project is completed, that the competitive advantages created by the product last for several years, and that there will be a "terminal value" left. (McGrath 2013)

Within the agile innovation framework, metrics are important with regard to two aspects: metrics that measure the performance and progress of individual innovation projects and metrics that are used to manage the performance of the organization.

Metrics to measure the performance of innovation projects

The topic of metrics for innovation projects is closely related to the testing phase where the value proposition and the business model are tested with customers. Ries (2011) highlights, that so-called "vanity metrics" such as total number of hits on a website or total number of users often disguise the real progress a team is making in terms of validating their value proposition. Instead, he proposes AAA-metrics (actionable, accessible, auditable) to accelerate learning. For metrics to be considered actionable, they must demonstrate clear cause and effect, e.g. show the connection between a new feature and an increase in customers. Accessibility refers to the widespread access to reports that are frequently updated and easy to comprehend. Finally, metrics must be auditable, i.e. credible to employees and based on definitions that are consistent with the understanding of project teams.

Beside AAA-metrics, measuring metrics and setting targets that reflect the iterative nature of the product development process are useful in assessing the progress of a project. Examples include average time to first prototype or number of consumers exposed to prototypes during the life of a project. (Brown 2008)

Performance Management

Performance management goes beyond measuring the outcomes of one particular project by dealing with the performance of the organization as a whole. Just like with other aspect approaches used in established firms, it needs to be adapted to support the principles of agile product development. For this purpose, Hope and Fraser (2003) propose performance contracts based on relative improvements instead of fixed targets. Relative improvement

contracts do not make managers commit to a fixed target and then control their future actions against it. Instead, they are based on the agreement that managers and employees will deliver continuous performance improvements. However, due to the high transparency of individual and team performance it is not a soft alternative to fixed performance contracts. Hope and Fraser (2003) describe fixed and relative performance contracts by comparing the underlying assumptions relating to several aspects of the performance management process. Their findings are summarized in Table 2.

Targets	Instead of setting a fixed sales/profit target, the organization trusts everyone to maximize profit potential by continuously improving against an agreed upon benchmark and remaining at the top of the industry peer group.
Rewards	Instead of a fixed reward, managers are rewarded by a peer review panel based on performance and with "hindsight" at the end of each year.
Plans	Instead of an agreed action plan, the organization trusts everyone to take whatever action is needed to meet medium-term goals.
Resources	Instead of a fixed budget amount, managers trust the organization to provide the resources needed to meet goals, and management trusts everyone will keep resources within agreed-upon key performance indicators.
Coordination	Instead of an imposed-from-above coordination of activities, the organization trusts that everyone will work together according to periodic agreements and customer requirements.
Controls	Instead of monthly performance monitoring, the organization trusts everyone will provide an accurate forecast based on the most likely outcome. The organization will only interfere when the indicators move out of bounds.

Table 2 Contrasting Fixed and Relative Performance Contracts (adapted from Hope and Fraser 2003)

Relative performance targets present a departure from performance monitoring processes that are rooted in a command-and-control style of management. Therefore, this topic is closely interlinked with chapter 3.3.6, where cultural aspects are discussed.

3.3.4 Governance-Risk-Compliance (GRC)

The topic of governance, risk and compliance is key when introducing agile practices in an organization. Within the agile innovation model, GRC rules and regulations help to create an environment that supports experimentation while mitigating risks and enforcing necessary regulations.

As GRC management processes are frequently designed and implemented within a command-and-control paradigm, established firms often experience a natural tension between product developers and GRC teams. These teams are charged with recommending and advising on how to reduce risks and meet compliance for applicable laws and regulations but are not held

accountable for the outcomes of the processes they mandate. (Humble et al. 2011) Therefore, good GRC management maintains a balance between implementing enough control to prevent negative events and allowing creativity and experimentation to continuously improve both the products and the value delivered to customers. Based on the analysis of Humble et al. (2011), four practical guidelines for aligning GRC processes and agile innovation methods can be identified:

1. Quantify risks and prioritize accordingly: If mitigation work needs to be completed to address a risk, it needs to be prioritized against other features that add value for customers, e.g. using the cost of delay method described in chapter 3.2.3.
2. Take a principles-based approach to risk management: As opposed to a rule-based approach to risk management, a principles-based approach focuses on the intent of the control mechanism. This helps GRC teams and product development teams cooperate to find viable solutions to mitigate risks instead of circumventing GRC-rules.
3. "Trust, but verify": Instead of preventing teams from accessing IT-environments to avoid damage, people are trusted and given access to the systems and hardware they need to use. Monitoring mechanisms and frequent reviews create transparency and avoid abuse.
4. Include GRC specialists as part of the cross-functional product development team from the start of the project: This has proven successful especially for information security specialists who contribute during technical design and testing to increase levels of security and privacy. In addition, this approach avoids large batch inspections after most of the development work has been completed and thus minimizes delays.

3.3.5 Team Management

The Agile Manifesto (Beedle et al. 2001) values "individuals and interactions over processes and tools", which sets the tone for all team-related aspects of agile innovation methods. In doing so, it also highlights the gap between a traditional emphasis on standardized software processes and agile practices that focus on competence and motivation. (Aaen 2008) Within the agile innovation framework, three aspects related to team management are identified as essential for organizations in order to apply agile product development methods effectively: Team setup, skills and the personality profile of team members.

Team Setup

Extant literature identifies three essential characteristics of successful innovation teams: They are (1) limited in size, (2) cross-functional and (3) co-located. In terms of team size, Humble et al. (2015) suggest an optimal number of 5-10 people to enable efficient communication and

maintain a shared understanding of what the team works on. If the project requires more resources, several teams of the same size are created and coordinated accordingly. Cross-functional teams consisting of fully-dedicated team members are recommended by Lüthje and Herstatt (2004) who observe that especially open innovation approaches are too demanding to be handled alongside routine duties in the companies' functional areas. This setup should be stable over the whole period of the product development process to enable idea transfer to subsequent phases. Finally, co-location of both software developers and business representatives facilitates communication between all team members and speeds up problem resolution. (Hosbond and Nielsen 2008)

This approach contradicts team structures that are frequently found in traditional product development projects, which focus on a high division of work, linear development processes and clear-cut handovers between departments. This affirms the importance of team management issues within the agile innovation framework.

Skills

Beside expert knowledge in their respective business functions, team members require additional skills relating to the agile innovation process and the relevant methodologies. In his framework for the adoption of agile methodologies, Chan (2008) identifies several ability-related factors that impact upon adoption. Chan focuses on agile software development methodologies (e.g. Scrum), but due to the similarities such as customer interaction or iterative development these findings can be generalized and integrated into the agile innovation model. Chan and Tong (2009) describe both "hard factors" (i.e. training and external support) and "soft factors" (i.e. experience and self-efficacy).

Formal training helps employees to accumulate knowledge about agile methodologies and transfer that knowledge to practice. Additionally, external support (i.e. use of trainers and consultants) may be required if no one in the organization has the expertise required to effectively implement a new way of developing products. (Chan and Tong 2009) In organizations that have successfully conducted agile projects, members of the initial project team may act as consultants. Brown (2008) describes the example of Kaiser Permanente, a US-based health care provide, where, after completing a successful project using design-thinking methods, the project's core team founded a separate innovation centre that introduces design thinking across the Kaiser organization.

Moving to the soft factors, general work experience on an individual as well as on a team level facilitates the adoption of new methodologies. With respect to software developers,

Chan and Tong (2009) found that experienced developers (i.e. developers with knowledge about other software development methodologies) were better able to recognize the benefits and adopt agile development techniques. Finally, self-efficacy, as a likely consequence of experience, also supports the adoption and dissemination of agile methodologies. If team members believe that they have the capability to use an agile methodology, they are more likely to actually employ it and engage in related knowledge sharing activities with their colleagues. (Chan and Tong 2009)

Personality Profile

In addition to methodological skills, several authors also list specific personality characteristics that make it easier for teams to adopt agile methodologies. Brown (2008) describes the traits of ideal team members: They are empathic, i.e. view the world from multiple perspectives and take a "people first" approach, and they are optimistic to successfully face challenges that lie ahead. Furthermore, successful innovators are integrative thinkers and have the ability to see and combine different and sometime contradictory aspects of a problem to create novel solutions. Finally, they experiment to explore the viability of alternatives in creative ways and collaborate in doing so.

Assembling a group of people who share these characteristics and possess prior experience with certain agile product development methods can greatly improve the chances for success in agile innovation projects. Combined with a cross-functional team setup, these aspects form an essential part of a holistic agile innovation model.

3.3.6 Culture

The previous sections illustrate the strong interdependence between organizational culture and its artefacts such as processes, guidelines and performance metrics. This shows that organizational culture exerts considerable influence on problem solving strategies, innovation practices, planning and control mechanisms and social relationships. (Nerur et al. 2005) Regarding the cultural aspects that influence agile innovation, two dominant themes are identified in the literature: Firstly, the need for organizations to shift towards a culture based on leadership and collaboration and secondly, creating a culture that enables risk-taking and experimentation.

Shift towards Transformational Leadership and Collaboration

Van Kelle et al. (2015) identify transformational leadership as one of the most important predictors of the success of agile projects. As opposed to a command-and-control model (i.e.

focused on clearly stated short term goals that are rigorously controlled), “transformational leadership refers to an adaptive leadership style that revolves around motivating, inspiring, expressing visions and engaging the emotional involvement of followers, while focusing on long-term commitment and engagement.” (van Kelle et al. 2015) Considering the emphasis on people and collaboration in agile methodologies, this type of leadership appears to be suitable for agile innovation projects. Transformational leadership leads to improved collaboration across organizational units, which also includes knowledge sharing. This, in turn, reinforces the adoption of agile methodologies as methodological knowledge is easily disseminated among employees. (Chan and Tong 2009)

Risk-taking and experimentation

In many organizations, managers have an incentive to disassociate themselves from failure because their organizational culture reward success and penalizes failure. This means that when failures are identified, social factors inhibit the constructive discussion and analysis through which learning occurs. (Cannon and Edmondson 2005) These cultural constraints prevent organizations from experimenting effectively, which is an integral part of agile methodologies and enables learning while minimizing costs. Therefore, Cannon and Edmondson (2005) argue that organizations should learn to fail intelligently as a deliberate strategy to promote innovation and improvement. For them, failures are a necessary by-product of experiments that are carried out for the purpose of learning and innovating. Failed experiments are not failures per se but provide new information to product developers that can later be incorporated into the development process. Appreciation of failed experiments encourages employees to “persevere when times get tough, engage in more challenging work, and outperform their risk-averse peers”. (Thomke and Reinertsen 2012)

In practice, a culture of failure tolerance can be fostered by (1) enabling experiments within the organization, (2) running retrospectives to analyse results and (3) training employees on giving constructive feedback to overcome the social stigma associated with failure. (Thomke and Reinertsen 2012) However, organizational culture is something that can never be mandated or agreed upon in a meeting. It is something that emerges through a repeated process and is strongly determined by the actions of leadership and management. (Schein 2010) If employees experience that they are given autonomy and trusted to take risks or if cross-functional communication is rewarded, they will be more likely to interact in a productive way that is in line with the principles of agile methodologies.

4 Transitioning towards Agile Innovation

The review of the relevant literature shows that there is a lot of research on the barriers to, and success factors of the adoption of agile software development methods but other, more business- or design-centric methods have not received as much attention. The same applies to concrete approaches towards the introduction of agile methods in organizations. Among others, Nerur (2005), Chan and Thong (2008) and van Kelle et al. (2015) provide a discussion of the introduction of agile software development methods. However, this research neglects aspects of agile methodologies that primarily concern non-technology domains of an organization as well as general aspects of change management.

This chapter fills this gap by providing an analysis of how to introduce the agile innovation model in established organisations. Firstly, it contrasts the agile innovation model with a traditional product development process and analyses the barriers that established organizations face when attempting this transformation. Afterwards, Kotter's change model is applied to this transformation process and used to describe the steps towards the introduction of the agile innovation model.

4.1 Contrasting Traditional Product Development and Agile Innovation

In many organizations, product development follows the principles of classical western systems of production, focussing on linear processes, high division of labour and tight management control. (Humble et al. 2015) In this respect, these product development models represent a stark contrast to agile innovation.

As a base for the subsequent analysis of the transition towards agile innovation, this section presents what is the status quo of product development in many organizations. It also analyses

the differences compared with the agile innovation approach outlined in the previous chapter, which need to be addressed in the transition.

4.1.1 Traditional Product Development: The Stage-Gate Process

The stage-gate process as described by Cooper (1990, 2008) is one of the most popular product development models in large organizations. For this reason, it is used as a reference model for a comparative analysis with the agile innovation model in the context of this thesis.

Cooper (2008) defines the stage-gate process as "both a conceptual and an operational model for moving a new product from idea to launch. It is a blueprint for managing the new product process to improve effectiveness and efficiency." It consists of (1) a series of stages, during which project work is completed and (2) gates, where go/kill decisions are made to continue to invest in the project. Figure 12 provides an overview of the elements of the stage-gate process.

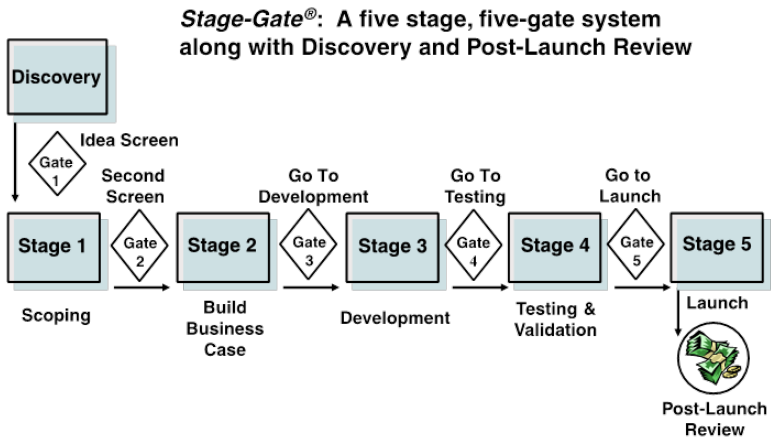

Figure 12 An Overview of a Typical Stage-Gates System for Major New Product Developments (Cooper 2008)

Gates act as entry points to each stage. They thereby control the process, similar to quality control checkpoints that control production processes. Each gate has its own set of deliverables or inputs, a certain set of exit criteria and an output. (Cooper 1990)

The stage-gate process applies a strictly linear process to product development and also uses this method to manage the innovation process. It divides the innovation process into a predetermined set of stages that starts with idea generation and ends with the launch of the product. Each stage is composed of several mandatory or optional activities, e.g. the "Validation" stage might consist of in-house prototype testing, field test with customers, or trial production. Each stage is typically more expensive than the preceding one. (Cooper 1990)

Cooper (1990) outlines the advantages of the stage-gate process, such as a higher focus on quality due to the stringent criteria at each gate, a stronger market orientation because market related activities can be built into the early stages of the process and a better overview of the project's status due to the clear structure provided by stages and gates.

A gate-oriented product development process is very much in line with the principles of traditional software development such as the waterfall model. Both approaches assume that problems are fully specifiable, and that an optimal and predictable solution exists for every problem. Deviations from the process are countered with extensive upfront planning. Just like the stage-gate process, traditional software development is process-centric and guided by the belief that successful product development can be accomplished by executing a highly optimized and repeatable process. Thus, planning and control using a command-and-control management style are essential elements of these methods. (Salerno et al. 2015, Nerur 2005)

4.1.2 Key Differentiators

The description of the agile innovation model in chapter 3 already hinted at several key differences between product development processes, that are frequently used in established organizations, and agile approaches to product development. Table 3 provides and overview of the most important aspects that distinguish traditional and agile product development processes. The traditional mode of product development as described above focuses on large companies with established R&D departments and time-consuming projects that require significant resources and are developed over months or years. These models have shown to be less effective for projects with a high degree of uncertainty and complexity, which are typical of radical innovation that involves new technological breakthroughs and/or new markets. (Salerno et al. 2015)

In sum, the key differentiator between the two models is the linear approach of traditional models versus the iterative approach in agile product development. According to Cooper's (1990) description of the stage-gate process, testing and validation is only done after the product is fully developed and the project ends with a post-launch review. Agile methodologies on the other hand, strongly focus on the implementation of prototypes and hypothesis testing very early in the innovation process. (Osterwalder 2014) Therefore, the design and testing phases are tightly interlinked and development teams iterate between these phases. Here, it is critical that early experiments produce a maximum of learning so that the product can be rapidly adapted. Established companies often use large-scale market research,

pilot studies or business plans to validate ideas. These learning instruments require refined documentation and involve substantial time and cost to be implemented. (Osterwalder 2014)

	Traditional	**Agile**
Fundamental Assumptions	Systems are fully specifiable, predictable, and can be built through meticulous and extensive planning and a linear, step-by-step process.	High-quality products can be developed by small teams using the principles of customer development and testing hypotheses based on rapid feedback cycles
Attitude towards change and failure	Failure is the exception. Changes to the plan once it has been agreed upon are considered problematic and indicate a failure in the process.	Failure is expected. The initial plan is not expected to survive contact with real customers. Improvements or pivots need to be made as quickly as possible.
Management style	Command-and-control, process-centric	Leadership-and-collaboration, people centric
Required skills	Requirements gathering, analysis, determination of costs, resource and dependency planning, ability to gain political support Hire for experience and ability to execute	Designing experiments and performing measurements, data collection and analysis, ability to work effectively in cross-functional teams and communicate with wider organization. Hire for learning, nimbleness and speed
Desired organizational form/structure	Mechanistic (bureaucratic with high formalization), departments by function.	Organic (flexible and participative encouraging cooperative social action) Small, cross-functional teams
Customer's role	Important	Critical
Engineering	Mostly waterfall or similar development models: fully specify the product before building it	Agile development: build the product iteratively and incrementally
Project cycle	Guided by tasks or activities	Guided by product features

Table 3 Comparison of Traditional and Agile New Product Development Processes along Several Dimensions (adapted from Nerur 2005, Humble et al. 2015 and Blank 2013)

4.2 Barriers to the Adoption of the Agile Innovation Model

Resulting from the substantial differences between traditional and agile product development, large organizations with established and formalized product development processes face challenges when trying to adopt agile product development methods. (Qumer and Henderson-Sellers 2008) However, due to their longer history, empirical studies on the barriers to the adoption of agile methodologies largely focus on agile software development. (Nerur 2005, Chan 2008, Chow and Cao 2008, Abdelnour-Nocera and Sharp 2008, van Kelle 2015 and others) This section attempts to generalize these findings and also incorporates qualitative insights about potential barriers that are discussed in business-oriented literature.

Resistance to change often originates from the characteristics of traditional product development and the strictly linear and formalized approach that is adopted in these models. Nerur (2005) observes that organizations conducive to innovation may embrace agile methods more easily than those built around bureaucracy and formalization. Migrating to agile methodologies is a change from a project-based model toward a model that supports feature-based development using evolutionary and iterative methods. Such a change entails major alterations in many areas of an organization, including work procedures, tools and techniques, communication channels, problem-solving strategies and people's roles. (Nerur 2005)

There are numerous barriers to this change process in established organizations and their importance is assessed differently depending on the area of the empirical study: Studies that strongly focus on core technical methods and processes rate aspects such as delivery strategy or agile software engineering techniques as highly important for the success of agile innovation efforts (e.g. Chow and Cao 2008) whereas studies that include social factors or other enablers in the corporate environment frequently cite cultural aspects among the most critical factors. (van Kelle 2015, Nerur 2005)

The barriers for the adoption of agile methodologies can be summarized as follows:

1. **Lack of executive sponsorship:** Hierarchical organizational culture and management style as well as the lack of top-management support are cited among the primary reasons why the introduction of agile methodologies fails. (Osterwalder 2014; Nerur et al. 2005) In addition to executive support, Abdelnour-Nocera and Sharp (2008) highlight the necessity to convince middle managers of the advantages of agile methodologies. They typically exert considerable control over day-to-day processes and resistance from this group within the organization can considerably slow down the change effort.
2. **Traditional organizational culture:** Traditional organizational cultures constrain the organization's ability to conduct experiments, because success (and not failure) is rewarded. Purposefully designing experiments and thus generating and accepting some failures is difficult in a general business culture where failures are stigmatized. (Cannon and Edmondson 2005)
3. **Lack of necessary team skills and agile-friendly team environment:** Agile teams need to be skilled in the application of agile methodologies as well as possess above-average levels of competence in their respective fields. This can pose serious problems related to staffing because firstly, competent people may be difficult to find and secondly, it might create a culture of elitism within the organisation that may affect the morale of non-agile

teams. (Nerur 2005) Besides methodological knowledge, teams that lack a culture of teamwork, close communication and stable relationships will be less successful in applying agile methods. (Chow and Tong 2008) These team qualities are nurtured within an environment that allows for close cross-functional cooperation. If essential preconditions such as co-locations, fully dedicated team members and cross-functional team composition are not established in the organization, innovation efforts will face considerable barriers.

4. **Rigid application of linear project management processes:** Traditional project management processes make it difficult to introduce agile innovation in a number of ways: The strong focus on upfront planning discourages experimentation, involving customers at multiple stages of the project is not designed into the process and go/kill-decisions might be made according to financial criteria that are not designed to evaluate innovation efforts. (Nerur 2005, Humble et al. 2015)
5. **Lack of customer involvement:** Customers play a critical role in agile product development and the success of innovation projects will hinge on finding lead users and customers who actively participate in the development process. (Chan 2008) As discussed above, project management methodologies discourage continuous customer involvement: Once the user requirements where defined, the possibilities to consider user input are limited. (Abdelnour-Nocera and Sharp 2008)
6. **Lack of agile delivery strategy:** Continuous delivery is a great challenge for many organisations that would like to move towards agile development. In addition to technological requirements, it also changes the roles of development and operations teams. Functional silos between IT operations departments and development departments as well as hierarchical organizational culture need to be overcome to fully benefit from agile methodologies. (Humble et al 2015)

In addition to factors that relate to the organization in general, Chow and Cao (2008) also name project-specific factors that might hinder the adoption of agile methodologies for certain types of projects: projects that are life-critical to the organization, have a pre-defined, fixed scope and are conducted by large teams are ill-suited for testing agile methodologies. These aspects need to be considered when selecting pilot projects for the introduction of agile methodologies.

In sum, the barriers for the adoption of agile innovation methodologies are closely interlinked and cannot be treated individually. For example, a hierarchical organizational culture influences project management processes, which in turn constrains possibilities for

experimentation and customer involvement. This calls for a holistic approach to transforming product development processes towards the agile innovation model.

4.3 Applying Kotter's Eight-Stage Change Process to the Adoption of Agile Innovation

As discussed in the previous section, adopting agile innovation as a model for new product development is a change process that affects a great variety of aspects in an organization. To facilitate this change, various change management models provide guidance by describing a series of process steps, which need to be completed in a transformation. By (2005) and Mento et al. (2002) provide a general analysis and comparison of several process-oriented change models including (1) Kanter et al.'s Ten Commandments for Executing Change, (2) Kotter's Eight-Stage Process for Successful Organisational Transformation, (3) Luecke's Seven Steps, (4) Jick's 10 steps for implementing change and (5) GE's change model by Garvin. Change models that describe the introduction of agile software development in particular, usually focus on software development processes, rather than organizational change. (Hayes and Richardson 2008) As agile innovation incorporates many aspects that affect the organization as a whole, a more holistic concept of change management needs to be applied. Therefore, Kotter's change model is selected for the purpose of this thesis based on its holistic view of the organization and its high level of recognition from the research community.

4.3.1 Overview

Kotter (2012) describes an eight-step process that helps organizations adapt to shifting environments in order to improve their competitive standing. Kotter developed this process as a reaction to several errors that are witnessed frequently in change processes. Even though the eight stages are described in a sequential order, they don't represent a linear process. After establishing the necessary urgency (stage 1), all change efforts end up operating in multiple stages at once, but skipping certain steps or getting too far ahead without a solid base will likely result in problems. The first four stages in the transformation process help defrost the status quo and subsequently, phase five to seven introduce new practices. (Kotter 2012) Figure 13 provides an overview of Kotter's change model.

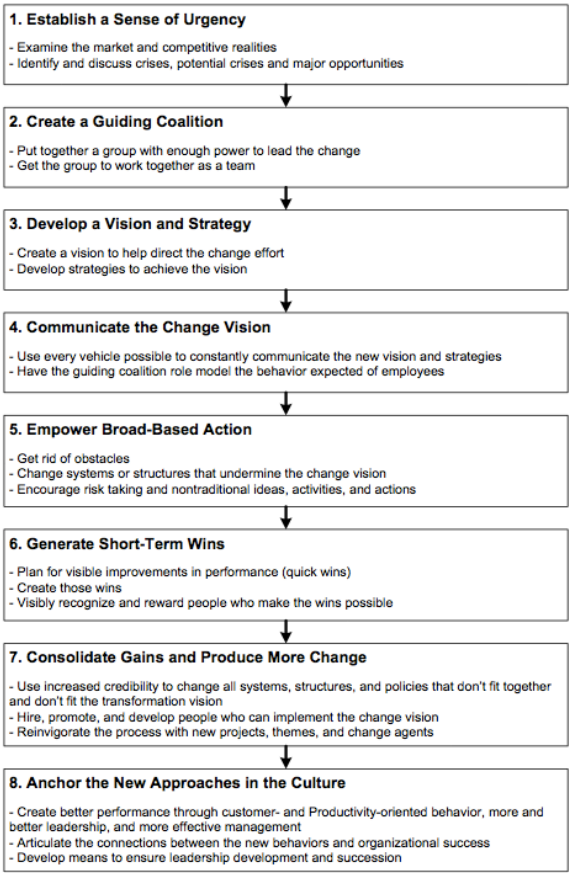

Figure 13 Kotter's Eight-Stage Change Process (Kotter 2012)

4.3.2 Establishing a Sense of Urgency

According to Kotter (2012), establishing a sense of urgency is crucial to gaining needed cooperation within the organization. High levels of complacency among managers make it difficult to raise urgency to a level that mobilizes the organization and induces the necessary momentum for change. Complacency is common in organizations that have enjoyed high growth in the past, yet they fail to recognize that their revenues, profits or competitive position deteriorate. The reasons for high complacency include the absence of a major crisis, rigid organizational structures that focus on narrow functional goals, internal measurement systems that focus on the wrong performance indicators or a lack of performance feedback from external sources.

One of the strongest ways to counter high levels of complacency is deliberately creating a crisis, e.g. by allowing a financial loss or exposing managers to major weaknesses vis-à-vis a competitor. Kotter (2012) also recommends setting artificially high targets for revenues, productivity or customer satisfaction and broadly communicating information about currently insufficient customer satisfaction or financial performance. Additionally, describing future

opportunities and the organization's inability to pursue them creates a more honest discussion about the need for change.

To facilitate the transformation towards agile innovation, communication needs to focus on one or more concrete business areas, customer segments or product groups. Simply attempting to change product development methodologies without a clear business-related goal will most likely be insufficient. A substantial amount of data, that supports the claim of low performance in one or more business areas, is essential to underpin the need for change. As summarized in Table 4, the analysis needs to include quantitative and qualitative data from multiple sources that focus on market performance, customer perception and the performance of the product development process itself:

Market and performance related	• Market shares in certain customer segments or business areas and their development over time. Comparison with competitors • Revenues and profits from these customer segments or business areas and future trends if change is not accomplished • Comparison of product portfolio with those of competitors in terms of quality, performance, price and customer perception to achieve a realistic assessment of current market position • Profitability of products: Cost of product development projects and relation to their actual success on the market
Customer related	• Customer satisfaction with current product portfolio • In-depth qualitative analysis of customer perception and pain points • Customer trends relating to a particular segment or business area
Product development process related	• Analysis of project portfolio relating to the three horizons: How many projects focus on developing new fields of business versus incremental improvements of existing products? • Percentage of revenue generated by products developed in the last several years in each of the horizons • Current time to market and duration of product development projects • Number/percentage of beta-tests, trials etc. done in these projects

Table 4 Analysis of Factors relating to Market, Customer and the Product Development Process

This information can be retrieved from existing reports, but also from analyses specifically created for this purpose, e.g. in-depth studies of customer satisfaction or the analysis of pain point along the customer journey. Ideally, qualitative information originates from direct contact between managers and customers such as discussion groups with customers who represent a particular segment. What's important is that direct contact with customers is not a one-time initiative but is repeated regularly.

The goal of this analysis is to stimulate an honest discussion about the current state of product innovation in the company, current developments on the market and potential future

trajectories. However, for the transformation towards agile innovation, it's not enough to create the awareness that innovation needs to be accelerated in a particular area of business but also that the way in which innovation activities are approached needs to change dramatically in order to succeed.

4.3.3 Creating a Guiding Coalition

A strong guiding coalition is essential to start a change process but also to sustain the pace of change over longer periods of time. Neither the CEO nor an individual manager can accomplish this task alone. Committees exist in organizations for various purposes, but they are ill suited to act as a guiding coalition in change efforts. Kotter (2012) describes four key characteristics of effective guiding coalitions: (1) they include several key players with line management responsibility, (2) they represent diverse points of view (in terms of discipline, work experience or nationality), (3) they enjoy high credibility and a good reputation within the organization and (4) they include proven leaders to drive the change. A well-composed guiding coalition has to build up a high level of trust and unite around a shared objective. A typical goal revolves around a commitment to excellence and a desire to lift the performance of the organization to the highest possible level. If a guiding coalition cannot be formed, the most common reason is that its members don't really believe that a transformation is necessary. In this case, it is necessary to revisit to the previous stage and discuss the urgency for change in more depth. (Kotter 2012)

For the transformation towards agile innovation, an effective guiding coalition must include key players from all domains that are affected by the transformation. This includes marketing, sales, customer service as well as engineering and operations departments. The formation of guiding coalition typically starts with several individuals that recognize the need for change, ideally from both the business side (e.g. marketing or customer service) and the technical side (e.g. engineering or operations). This group of managers should champion the adoption of agile methods and take the responsibility for eliminating any obstacles to their effective implementation on a formal and informal level. It is crucial to include engineering early in the process, as they also have to adopt new ways of working if agile innovation methodologies are implemented to their full extent. Subsequently, a top executive needs to quickly come on board to facilitate the enlargement of the agile team and integrate key line managers that might be hesitant in the beginning.

Building up trust between the members of the guiding coalition and aligning their goals is key in the first phase of the change process. This can be reached by workshops or off-site events

where the insights from the analysis described above are discussed and the goal of the change process is formulated.

4.3.4 Developing a Vision and Strategy

"Vision refers to a picture of the future with some implicit or explicit commentary on why people should strive to create that future." (Kotter 2012) Therefore, a vision needs to appeal to both the head and the heart of employees. Formulating a clear vision has several positive impacts on a change process: it clarifies the general direction for change, it facilitates change by motivating action that is not necessarily in people's short-term interest and finally, it helps to coordinate the actions of different people. According to Kotter (2012) an effective vision conveys a realistic and attainable picture of what the future will look like that is easy to communicate. It is focused yet flexible enough to allow for individual initiative. Finally, it needs to appeal to the long-term interest of all stakeholders.

For the transition towards agile innovation, the vision of the change process needs to include firstly, a desired outcome for a particular customer segment or area of business and secondly, a description of the new ways of working that need to be adopted throughout the organization to achieve this goal. Therefore, several aspects need to be incorporated in the change vision that describes the business and organizational outcomes:

Business outcomes	**Organizational outcomes**
• Increase competitiveness of products, quality perceived by customers and customer satisfaction • Reduce product development costs • Reduce time to market	• Increase customer focus • Change organizational culture to allow for experimentation • Create a climate of cross-functional cooperation based on trust

Table 5 Business Outcomes and Organizational Outcomes of the Transition towards Agile Innovation

These change goals need to be underpinned with concrete, measurable goals relating to a specific customer segment or area of business. For example: "We want to become the market leader in the customer segment of small business customers by improving our value proposition and launching new, innovative services for this target group. To increase profitability, we will reduce our product development costs by at least 30 percent and launch new products within an average 2 months, all within the next three years. We aim at increasing customer satisfaction by 20 percent during that time. This will require that we dramatically increase our customer focus, experiment with new ideas and change the way we work towards strong cross-functional cooperation based on mutual trust." (adapted from Kotter 2012)

4.3.5 Communicating the Change Vision

From the very beginning of the change effort, communication is critical. “Clear, simple, memorable, often repeated, consistent communication from multiple sources modelled by executive behaviour, helps enormously”, says Kotter (2012). This statement contains several essential elements of effective communication of a change vision: It needs to be simple and avoid jargon and to use verbal pictures and examples to illustrate the necessary changes. Furthermore, multiple communication channels ranging from town hall meetings to informal communication help spread the message. And finally, observing behaviour that is in line with the change goals strongly supports written or verbal communication. The goal of this communication effort is to increase the organisation’s understanding and commitment to change, to reduce resistance and prepare employees for both the positive and negative effects of the change. (Mento et al. 2002)

To communicate the need for increased agility effectively, a highly visible event such as an all-hands meeting of the involved members of staff can be used as a starting point. The members of the guiding coalition need to be present to communicate and reinforce the change vision. However, the transition towards agile innovation methodologies impacts different parts of the organization in very different ways. For example, the marketing department needs to ramp-up their abilities to retrieve and process input from end customers whereas IT operations need to familiarize themselves with continuous delivery and changing their governance framework. Therefore, follow-up communication within the departments needs to detail the change vision with respect to the particular impact on each unit. This is also an opportunity for managers to enter a bi-directional mode of communication and start an honest and intense dialogue with their teams about the challenges that lie ahead. Managers of involved organizational units also need to continue this dialogue beyond formal events or presentations but need also to include change messages into their informal communication on a daily basis. This helps them to understand the concerns of employees who might not be comfortable speaking about their reservations at formal occasions.

Besides an honest and open dialogue with employees, leading by example is an effective way to encourage change: If members of the guiding coalition and their management teams take part in lead user workshops, watch customer focus groups and participate in trainings, they show that they are serious about changing their own behaviour. In addition, they can use what they saw and heard during these events in their daily, informal communication to underscore the need for change by real-life examples.

4.3.6 Empowering Employees for Broad-Based Action

After the first four phases, that focused on goal-setting and communication, the subsequent phases introduce concrete new practices. Therefore, the purpose of this stage is to remove existing barriers to the implementation of the change vision. (Kotter 2012)

Kotter (2012) identifies four main areas that act as a barrier to change: (1) formal structures make it difficult for employees to act according to the change vision, (2) managers discourage actions aimed at implementing the new vision, (3) a lack of needed skills undermines action and (4) personnel and information systems make it difficult for employees to act.

When introducing agile product development methodologies, eliminating barriers that result from formal structures, is a particularly important first step. As discussed in chapter 4.2, the barriers that result from the structural boundaries of traditional stage-gate processes can be huge for agile innovation efforts. At this stage, it therefore makes sense to look at the project portfolio and classify projects into horizon 1-3 (see chapter 3.3.1). An upcoming horizon-3-project can be selected as a pilot project that is not bound to the standards of the current stage-gate process but uses agile methodologies from the beginning.

Removing structural barriers is closely related with managing resistance from middle managers who have come to appreciate the advantages of these structures for their personal goals. Self-organizing, co-located teams make it difficult for middle managers to control their employees and changes in governance structures and decision-making criteria for the allocation of budget might limit their personal sphere of influence. According to Kotter (2012), confronting supervisors who undercut needed change and entering into an honest dialogue with them is the best answer in these situations. This means going back to the previous phase of the change process and communicating the goals of the transformation for his or her particular part of the organization. Additionally, this needs to be underpinned with AAA-metrics (see chapter 3.3.3) relating to the pilot project, which are integrated into the performance contract of the manager.

Providing methodological training is an essential element of empowering team members to actually use agile methods in their daily work. Depending on their functional area, employees need to build up knowledge relating to lead user processes, designing experiments, facilitating customer feedback and using agile software development methods. Both the core innovation process (see chapter 3.2) as well as the enabling elements (see chapter 3.3) need to be covered in the trainings. Besides core knowledge about agile methodologies, teaching social skills and attitude is particularly important when transforming towards agile innovation. It contributes to

building up an organizational culture that is customer-centric, team-oriented and is tolerant towards experimentation and failure (see chapter 3.3.6). Generally, a step-by-step approach to training is recommended: Starting with a pilot project in one particular area of business does not make it necessary to provide large-scale trainings to all member of the organization. Instead, trainings should first focus on those employees participating in the pilot project and then be gradually expanded to the rest or the organization.

Finally, to support the training effort, personnel and information systems need to be adapted. This goes hand in hand with changes in the supporting elements of the agile innovation model: To support the core agile innovation process, performance evaluation metrics, portfolio and financial planning and governance need to be adapted accordingly in this phase. Kotter (2012) explains that due to resource constraints or political power, the guiding coalition is rarely able to change all parts of the organization at the same time. Therefore, in line with the pilot project approach, only those elements that are necessary to support these pilots need to be adapted. If agile innovation methods should be applied to horizon 3 projects, their metrics, financial planning processes and governance structures should be adjusted as well in this phase of the change process.

4.3.7 Generating Short-Term Wins

Sustaining the momentum of a major change process is immensely difficult without convincing evidence that all the effort is paying off. Especially those members of the organization who are sceptical about the change process need to see clear data indicating that the changes are working. Therefore, deliberately planning for performance improvements within the first six to eighteen months of a change process is a powerful instrument to demonstrate the success of a change initiative. (Kotter 2012)

Kotter (2012) describes three key characteristics of short-term wins: They need to (1) be visible to a large number of people in the organization, (2) unambiguously show performance improvements and (3) clearly relate to the change effort. Besides providing evidence of the effectiveness of the change effort and visibly rewarding change agents, short-term wins also help to test the change vision against concrete conditions. Change strategies frequently need some adjustment, and without the short-term wins, problems can become apparent far too late in the process. (Kotter 2012)

In the transition towards agile innovation, pilot projects help to generate visible short-terms wins. Changing product development methods in a clearly defined and limited part of the

organization increases the chances of success, which in turn helps to gain acceptance within the organization. Humble et al. (2015) recommend starting with a single, cross-functional product or service, whose managers support the transformation. It is particularly important to pay attention to the composition of the project team: The team needs to be composed of people with a growth mindset (as discussed in chapter 2.3) and the methodological ability to pursue the project.

Within the pilot project, short-term wins can be achieved within the three core phases of the innovation process: A successful lead user workshop that generates new product ideas proves that the organization can effectively use newly acquired methodological capabilities. Tests of prototypes with customers, which help to improve a product's features, show that customer integration is indeed valuable for product development. And reduced time to market shows that agile software development methods make product development more efficient.

It is important to ensure that short-term wins show the characteristics described by Kotter (2012). Applying new methodologies is a first step towards a desired change goal, but not yet a short-term win per se. Therefore, performance measurement is particularly important in this phase, as traditional metrics frequently either fail to record important performance improvements or underestimate their size. (Kotter 2012) For agile innovation, this means that the metrics, which measure the success of the pilot project, are defined early on and performance measurement systems are adapted accordingly.

Finally, short-term wins also help to secure resources and continued support from executive sponsors. Sponsors might fear over-commitment and must see that positive progress is occurring. (Mento et al. 2002) For agile innovation, this means that short-term wins relating to the core innovation process need to be visible before major changes to some of the supporting elements can be made. Changes in financial management process or IT-governance might be politically difficult to achieve and therefore need broad support backed by clear evidence of success.

4.3.8 Consolidating Gains and Producing More Change

Kotter (2012) warns that "the forces of tradition can sweep back in with remarkable force and speed", if high urgency levels cannot be sustained. Change is very fragile until all involved units of the organization have broadly absorbed the new practices. One of the reasons why this large-scale change is difficult to achieve is the increasing interdependence between all parts of an organization. High interdependence is an unavoidable side effect of an

organization's attempt to be fast, less costly and more customer focused. And therefore, the close linkages created by just-in-time-production or faster product development makes it difficult to change something without eventually changing everything. (Kotter 2012)

Ultimately, the change effort will result in multiple projects conducted simultaneously, which is only possible if "(a) senior executives focus mostly on the overall leadership tasks and (b) senior executives delegate responsibility for management and more detailed leadership as low as possible in the organization." (Kotter 2012) At this stage, a successful, major change effort therefore involves additional and bigger change projects, a larger group of employees who contribute to these projects and assume leadership in their sphere of influence, and continued high levels of urgency upheld by senior management.

For the transformation towards agile innovation, this means that more aspects of the agile innovation model are gradually added to the organization's set of competences. The first pilot project does not need to involve all core elements of the final model but they can be added in successive projects based on the insights gained from previous pilot projects. Agile software development integrates this practice of continuous learning by conducting retrospectives after each sprint as well as after the completion of a project. During the retrospective meetings, the team decides what elements of the processes need to be added, removed or adapted to improve the performance in the future. (Hayes and Richardson 2008) Retrospectives also can be used to showcase accomplishments of the pilot project and gain support from those stakeholders who will be involved in the next phase.

In addition, the enabling elements of the model increase in importance at this stage to ensure that change lasts beyond pilot projects. Until now in the change process, isolated agile pilot project were exempted from the traditional processes for portfolio planning, budgeting or performance evaluation. In this stage of the change process, new processes that apply to larger parts of the project portfolio need to be developed.

4.3.9 Anchoring New Approaches in the Culture

"Overmanaged and underled" companies, as Kotter (2012) calls them, face the danger that accomplishments of change processes are reversed when, for example, key influencers drop out of the company before the new practices are firmly anchored in the corporate culture. However, even though the magnitude of change often seems enormous, the new change vision is not incompatible with the existing corporate culture in many cases. (Kotter 2012)

For example, a “customer first” attitude might exist in an organization, but the practices that are used to express this value need to be updated.

Kotter (2012) argues that cultural change comes at the end of a transformation, not at the beginning. Organizational cultures that have grown over years change only after people’s behaviours change, after this behaviour produces benefits for a certain period of time and after people observe a connection between the changes in behaviour and performance improvements. Acknowledging the benefits of a transformation and admitting the validity of newly installed practices is difficult in strong corporate cultures. Therefore, it needs to be supported by consistent and frequent communication. Eventually, anchoring change in a corporate culture may require staff turnover: Changing key people who consistently oppose change is inevitable in some cases. Subsequently, decisions on successions are crucial and need to be made in line with the desired cultural values. (Kotter 2012)

Perhaps the strongest cultural impact of a transformation towards agile innovation is shifting from a command-and-control management to a culture based on leadership and collaboration. Anchoring this fundamental change in the organization requires clearly observable changes in the organization relating to all parts of the agile innovation model. Just like the adoption of agile innovation methods, cultural change diffuses through the organization gradually. People with a growth mindset who easily adopt new innovation practices will be the first to act according to new cultural values thus passing them on within their teams and organizational units. Once positive results are achieved, early adopters embrace these values followed by the early majority and eventually the rest of the organization. (Humble et al. 2015)

In brief, nothing is as strong as a face-to-face experience of the cultural values of agile innovation: “Are people given autonomy to act and trusted to take risks? Is failure punished or does it lead to enquiry and improvements? Is cross-functional communication rewarded or discouraged?” (Humble et al. 2015) If key members of the organization behave in line with the new cultural values and provide support for employees to adopt new practices, the organizational culture will change as a result.

5 Case Study

In the previous chapters, this thesis developed a model for agile product development (the agile innovation model, chapter 3) and described the steps of a transition from a traditional product development process towards the agile innovation model within an organization (chapter 4). Based on these theoretical models, the subsequent case study delves into the realities of product development in large enterprises. It seeks to firstly, examine the status quo of innovation and product development activities in an Austrian telecommunications company and secondly, validate both the agile innovation model itself and the suggested transformation approach. Subsequently, the findings are presented and integrated into the agile innovation model.

5.1 Selection of Industry and Respondents

The telecommunication industry was selected out of a personal interest of the author and due to the availability of contacts to managers and employees who deal with product development within this industry. Additionally, product development in the telecommunications industry presents several interesting challenges: Product development is technically complex and typically takes about 6-18 months. It requires close cooperation of multiple departments within the organizations thus creating high interdependence between all parts of the system. A considerable part of product development efforts consists of developing software, which makes this industry a good study object for agile software development methodologies. And finally, due to declining revenues from its core business, the telecommunication industry needs to tap into new sources of revenue, which increases the pressure to innovate.

The respondents for this case study were selected to represent a variety of professional profiles within the company. Among the 9 respondents, 3 are currently in executive or top-management positions, 3 are middle-managers and 3 are team members without managerial responsibility. They were selected based on their hierarchical position as well as on their

functional background and their role within the product development process. Several respondents had worked with agile product development methods in the past, which made them good candidates for providing input on the agile innovation model. In terms of functional expertise, 3 respondents have a background in marketing, 3 work in technology-related fields, 2 are project or portfolio managers and 1 works in a staff position focused on customer experience and training. In terms of work experience, most participants have worked at the selected telecommunications company for at least 5 years and the most senior experts have more than 20 years of relevant experience.

5.2 Data Collection

For this case study, data was collected by conducting semi-structured interviews with firm executives and industry experts. Semi-structured interviews were selected as a method of data collection because in contrast to other forms of data collection (e.g. online surveys), they provide an opportunity for respondents to elaborate on their views and experiences and add new aspects to the concepts under discussion. Furthermore, the interviewer can ask for additional information in case of ambiguous answers. Each interview lasted about 40 to 60 minutes, depending on the depth of answers that respondents provided.

The questionnaire for the semi-structured interviews is divided into three main parts: (1) the analysis of the current product development process, (2) the reflection and validation of the agile innovation model and (3) the reflection and validation of the transformation process towards agile innovation. The following section details the key questions that guide the interviews:

Part 1: Analysis of the status quo

The goal of the first part of the interview is to gain insights into the current product development process and about the status quo of agile methods and practices in the organization. Additionally, a common understanding of the term “agile product development” is established.

a) How is the current product development process structured and what are the perceived strengths and weaknesses?
b) What is your current role within the product development process? What challenges are associated with your particular role?
c) How you do define agile product development and which concrete methods do you consider under this term?

d) Which agile methods are currently employed to develop products in your organization? Are customers involved in product development? If yes, how are these aspects integrated into the overall product development process?

Part 2: Reflect and validate the agile innovation model

The goal of the second part is to gain insights into whether and how agile product development practices support the two core aims of agile innovation (reduced time to market and increased customer focus) from the perspective of the respondent.

The agile innovation model is not presented to the interviewees but the questions aim at checking for consistency between the elements of the model and the aspects mentioned by the interviewees.

a) General questions on the necessity for differentiation between innovation and continuous improvement in product development: Do product development methods need to differ depending on the innovativeness of the product? (e.g. existing area of business vs. new area of business) If yes, in what way? If no, why not?
b) Core elements of the model: What methods or practices help to make the core product development process for innovative products faster and more customer focused? What role do agile product development methods play here?
c) Supporting elements of the model: What preconditions need to be established in an organization in order to successfully implement these practices?
d) How does employing agile product development methods generally impact the performance of the product development process and the products developed?

Part 3: Reflect and validate the transition process towards agile innovation

The goal of the third part of the interview is to gain insights into how to introduce agile practices. Particular focus is placed on the respondent's organizational unit and area of responsibility.

a) If an organization would attempt to change product development processes towards using agile innovation methods, how would you personally approach this transformation? What steps are necessary to introduce agile innovation methods and who are the key actors who need to be involved?
b) How does your organizational unit need to change in order to introduce these practices?

c) What are critical success factors and barriers to the adoption of agile innovation in general and in your organizational unit in particular?
d) Do you have any concrete recommendations for your organization with respect to introducing agile innovation methods?

Several questions in the survey refer to practical experience with using agile product development methods. It is expected that those respondents, who have used agile methods in the past, will be able to provide more valuable insights relating to these questions compared to respondent with no practical experience. This distinction between experienced and non-experienced respondents is considered in the subsequent analysis where appropriate.

5.3 Data Analysis and Pattern Recognition

The semi-structured interviews, which were used to collect data for the case study, were recorded and transcribed. The individual responses were analysed and compared to identify similarities and patterns. The findings were extracted by comparing the consolidated answers of respondents to the elements of the agile innovation model and the transformation process discussed in chapter 3 and 4. Similarities and divergences are described in the findings.

Finally, those findings were identified that describe changes or additions to the agile innovation model. They were integrated into the agile innovation model by mapping them either to the respective core or supporting element or to the transformation process. This results in several amendments to the agile innovation model, which are described in section 5.5.

5.4 Research Results

The semi-structured interviews were conducted to challenge the agile innovation model and the change process that companies need to undergo when introducing it. The findings described in this section therefore validate or amend the model's assumptions. Based on the structure of the questionnaire, this section describes the research results relating to (1) the status quo of product development in the company, (2) the agile innovation model itself and (3) the transformation towards it.

5.4.1 Analysis of the Status Quo

In the first part of the interview, respondents were asked to describe the current product development process from their perspective.

a) How is the current product development process structured and what are the perceived strengths and weaknesses?

The company currently uses a classical stage-gate process to handle product developments. The product development process (PDP) is well defined, communicated and executed within the company. It is strictly serial, based on a waterfall-model for software development and is optimized for the incremental improvement of products in the core field of business. Several respondents consider these features of the PDP essential to enable efficient product development particularly for core products. The PDP also serves very important purposes with respect to the orchestration of different departments during product development and yearly budget planning and controlling. All respondents voice criticism of the PDP, which is attributed to several reasons: The PDP is considered bureaucratic and over-administrated with multiple gates serving similar purposes and requiring project managers to present their projects in multiple committees. Due to yearly budget cycles, the current PDP also favours a short-term view focused on product improvements and quick wins.

Finding 1: The current stage-gate product development process is perceived as too rigid and inflexible to allow for iterative product development and experimentation. Respondents recognize the need for simplifying the current process and changing it to enable the iterative development of innovative products.

The current PDP is well established in the firm and closely intertwined with planning processes such as portfolio planning. Departments such as sales or customer service can rely on clearly defined structures and they contribute to product development projects along well-defined processes. This assures that all requirements such as integration into legacy systems to enable automated ordering processes and activation of products for customers are incorporated into product developments. Several respondents stress that this consensus-based approach to product development inhibits prioritization of features and puts pressure on project managers to incorporate all requested features into the project's scope. This impacts the size of the project's scope in general but also prolongs implementation timelines due to the complexity of legacy systems.

Finding 2: The current PDP favours the development of "perfect" products that fulfil the requirements of all involved departments. This increases the complexity of product development and inhibits clear prioritization of features and functionalities.

Even though respondents are aware of the drawbacks of the PDP, they take a differentiated view and acknowledge that is has several benefits for the organization: Firstly, it helps

coordinating the efforts of multiple departments within a large organization. Secondly, it structures product development projects and thirdly, it steers investments and helps making funding decisions. Several respondents mention its high utility for developing products in the core business. It is therefore designed to support the development of standardized, large-scale products that are highly automated and address large segments of the target market.

Finding 3: The advantages of a PDP based on a stage-gate process are mainly seen in developing large-scale, standardized products within the core business of the organization.

Several respondents elaborate on how the PDP impacts upon cross-departmental cooperation. The focus on requirements-gathering from all departments results in silo-thinking and a sense of entitlement with regard to the fulfilment of business requirements. The quantity of requirements that are collected form all departments within the current PDP increases development time massively and postpones product launches. In addition, if certain business requirements are not within the scope of a project, they can seldom be implemented at a later stage once the project has been closed. This results in considerable pressure on project- and product managers to consider all requirements from their internal clients.

Finding 4: The current PDP has a strong influence on the culture within the company, resulting in functional silos and inflexibility relating to prioritization of requirements. It discourages experimentation and iterative adaptation of product concepts and favours a "big-bang" approach to product launches.

Several respondents emphasize that during the last 1-2 years, some projects have developed and launched their products in multiple phases, thus introducing a first attempt for iterative product development. This is an approach that is still within the limits of the current PDP but attempts to increase flexibility. Additionally, selected product development projects that are not bound to the restrictions of the PDP have tried to use agile software development methods in the past. This has been partly successful but both the organizational culture and established processes pose a considerable challenge.

Finding 5: Awareness, that iterative approaches have positive effects on product development, starts to rise within the organization.

b) What is your current role within the product development process? What challenges are associated with your particular role?

Respondents fill different roles with respect to the current PDP, ranging from portfolio management to managing the technical implementation of products. Several respondents also

occupy staff or management functions that don't have a direct role in individual product development projects. Nevertheless, they are in a position to shape the processes and general conditions that govern product development.

Challenges associated with these roles are similarly diverse. Respondents who are directly involved in product development report a lack of resources and time devoted to developing product concepts and validating them with customers. Creating MVPs and testing them with customers is not part of the current process and organizational culture makes it difficult to launch products that don't include all desired features. Respondents who have previous experience with agile product development methods are faced with the challenge of using and implementing them within the current PDP framework.

Finding 6: Both existing processes and corporate culture result in challenges relating to customer involvement and prototyping.

Finding 7: Employees in both staff and management functions report facing the challenge to induce change in the organization and try out new approaches to product development. Again, established processes and organizational culture act as a barrier.

Due to resource constraints, product managers often have to fill the role of project managers in product development projects. Respondents with a background in marketing report that this double-role diverts their attention away from customer needs and product features towards internal coordination and requirements-gathering.

Finding 8: Roles within the PDP are designed with a focus on internal coordination, but they don't support understanding customer needs and experimentation.

c) How you do define agile product development and which concrete methods do you consider under this term?

This part of the interview seeks to establish a common understanding of the term "agile". Respondents generally have a good understanding of agile product development. Depending on their area of expertise, they place their focus on either IT-related methods such as Scrum or Extreme Programming or on design related aspects of agile product development. Respondents in staff or management functions have a good overview of both domains and are aware of their close interdependence.

Creating MVPs and prototypes and testing them with customers is one of the most frequently cited aspects of agile product development, followed by iterative product releases and feedback loops with customers. For idea generation, analysing consumer trends and

integrating them in product concepts is considered essential to meet customer needs. Additionally, interacting with lead customers during idea generation and collecting their feedback on product releases are important aspects of agile product development.

Finding 9: Respondents have a holistic view of agile product development methods and are aware of the close interdependence between business and technological aspects.

Finding 10: Relating to specific methods with a business background, creating prototypes and testing them with customers is most frequently mentioned.

Respondents with IT-background tend to focus on agile software development methods and methods that support continuous delivery. Scrum is the most frequently mentioned method among all respondents. Additionally, implementing continuous delivery of software is considered essential but regarded as a great challenge for established organization. Broader concepts such as bi-modal IT, which aim at finding a balance between continuous improvement of existing systems and creating new software to develop new products, are also mentioned by individual respondents.

Finding 11: Among agile product development methods that originate in IT, Scrum is the most well-known methods.

Respondents who have managerial responsibilities in the company tend to describe agile product development methods in terms of outcomes, rather than in terms of methods. Reducing project duration, improving time to market and avoiding sunk costs are desired outcomes that are most frequently mentioned by managers. In addition, an iterative approach and the flexibility to adapt product design in the course of the project are considered important.

Finding 12: Executives and members of the organization with managerial responsibility assume a strongly outcome-oriented view on agile methods emphasizing short product duration and time to market as well as avoidance of sunk costs.

d) Which agile methods are currently employed to develop products in your organization? Are customers involved in product development? If yes, how are these aspects integrated into the overall product development process?

Most respondent report having applied agile product development methods on one or more occasions in their current or previous job. However, they agree that this is the exception from standard processes, which do not allow for agile product development. They also share the perception that the application of agile product development methods was so far restricted to

individual teams or departments that tried out these methods in order to improve their processes or work results. Previous attempts to use agile software development methods on a broader scale have been halted by cost considerations, supplier consolidation and revised IT delivery processes. Projects that do not follow the PDP have some freedom to try out agile methods. For example, mobile apps are developed using Scrum and data warehouse teams have experimented with agile software development.

Finding 13: The organization already has some experience with applying agile product development methods, but their application has so far been fragmented and limited to individual departments.

Respondents report that customers are involved in product development and in most instances their involvement takes the form of market research or focus groups. Interactions with customers usually happen once or twice in the course of a product development projects. Methods relating to idea generation and customer involvement were presented and taught in workshops but did not find their way into the standard practice in product development. Validation of ideas or product concepts are also generally done in the form of market research or focus groups, however, this is not mandatory for all product developments. Particularly respondents with a background in marketing report that the first phases of idea generation and validation lack structured validation of ideas with customers.

In the past, the organization has collected considerable prior experience with customer involvement in all phases of the product development process. Customer conferences, consumer trend analysis, testing of prototypes and ethnographic research have been conducted in the past but these methods are currently not considered a standard part of the product development process and therefore not applied in a structured way.

Finding 14: With regard to customer involvement, the organization mostly resorts to classical market research in the form of quantitative market studies or focus groups. However, there is experience with alternative methods such as ethnographic research and prototype testing which play an important role in agile product development.

Finding 15: Within the current PDP, it largely depends on the initiative of the respective project or product manager whether and how customers are involved in product development. The most likely form of customer involvement is quantitative or qualitative market research.

In relation to the application of agile software development methods, several respondents report that these were applied in IT-departments in the past to make the software development

process more flexible and improve customer orientation. Their experience showed mixed results where cooperation with business departments is concerned: While some projects integrated business representatives successfully as product owners, other colleagues struggled to adapt their current ways of working to move towards agile methods.

Finding 16: The respondents' experiences shows that technical approaches to agile product development have difficulties transcending the boundaries of IT-departments and involving business representatives. This confirms that the challenge of bridging the gap between business and engineering departments when applying agile software development methods.

5.4.2 The Agile Innovation Model

The second part of the interviews looks at the elements of the agile innovation model and their impact on the outcome of the product development process.

a) General question on the necessity for differentiation between innovation and continuous improvement in product development: Do product development methods need to differ depending on the innovativeness of the product? (e.g. existing area of business vs. new area of business) If yes, in what way? If no, why not?

Respondent have different views on how to characterize those projects that are suitable for agile product development. All respondent agree that products that aim at tapping into new fields of business are obvious candidates for methods such as prototyping, agile software development and various forms of customer involvement. However, the core business can benefit from using agile innovation methods as well. This refers particularly to customer involvement in the idea generation phase, consumer trend workshops, frequent customer feedback or the MVP concept.

Finding 17: Respondents agree that agile innovation methods support the development of innovative products or help to tap into new fields of business, but selected methods, particularly customer involvement, can be applied across all projects. Therefore, the decision about the use of selected agile methods needs to be made for each project individually.

With respect to prototyping, several respondents voice concern that immature prototypes might harm the company's image as a high quality brand. Therefore, there is a strong preference for prototyping with small customer groups first and only releasing mature products on the general market. Projects that operate in highly uncertain market conditions are particularly suitable for using agile methods. Once agile methods prove useful in these projects, they can trickle down to the core business.

Finding 18: Respondents distinguish between new fields of business and core products with respect to the sequence of introducing agile methods: Innovative products that tap into new markets should be the first ones to try out agile methods and only if this has proven successful, agile methods can be applied to improve core products as well.

From a technology perspective, it is not so much the innovativeness or the field of business that distinguishes agile from non-agile product developments, but the degree of independence from legacy systems. Products that don't have strong linkages to legacy systems are more suitable for applying agile methods because teams can work independently and release frequently. Taking a long-term perspective, products might be developed independently using agile methods, but if they are successful, they need to be re-integrated into the legacy systems at a certain stage. This stage is usually attained when products reach a certain number of customers.

Finding 19: From an IT-perspective, independence from legacy systems is an important criterion when identifying those product development projects that are suitable for the application of agile development methods.

Finding 20: Even though independence from legacy IT-systems makes using agile product development methods easier, re-integration of successful new products should not be neglected and needs to be planned well in advance.

b) Core elements of the model: What methods or practices help to make the core product development process for innovative products faster and more customer focused? What role do agile product development methods play here?

Respondents agree that agile product development methods are key to improving the effectiveness of product development. Regardless of their function area of expertise, respondents place great importance on the ability to conduct experiments, i.e. the testing phase. Respondents associate this with methods such as creating MVPs, prototyping and continuous deployment. For the design phase, respondents name methods such as design thinking, consumer trend workshops or lead user workshops. For the acceleration phase, respondents focus on Scrum, extreme programming, continuous deployment and kanban boards to track progress of implementation.

Finding 21: The answers of the respondents largely conform to the core elements of the agile innovation model. Depending on their area of expertise, respondents either tend to focus on business- or tech-related methods.

Finding 22: Among all methods mentioned by the respondents, those that focus on experimentation and prototyping receive the most attention. Respondents state that their own organization lacks the ability and willingness to experiment and test prototypes with customers in early stages of product development projects.

Finding 23: In addition to lead user workshops, other methods such as trend workshops can be used to generate product ideas in the first phase of a product development project.

c) Supporting elements of the model: What preconditions need to be established in an organization to successfully implement these practices?

Respondents are very aware of the necessary preconditions that enable agile product development. Most respondents mention team aspects as the most important factors that influence the success of agile methods: projects teams need to be cross-functional, ideally co-located and ideally 100 percent of their resources should be dedicated to a specific project. Business representatives that are assigned to the project should have extensive experience in the front-line activities of their departments to enable a direct transfer of knowledge into the project. Particularly respondents with handy-on experience in product development projects emphasize that including experts in project teams is key in both improving quality and speeding up product development projects. Roles such as SPOCs (single point of contact), who act as business representatives in multiple projects, are considered less effective compared to subject matter experts within the context of agile projects. Product owners are another essential role within agile product teams. They need to be empowered to makes decisions about all aspects of the proposition and the business model. Currently, product managers are in a comparably less powerful position as they can decide about product features but have limited impact on decisions relating to aspects such as sales or service channels.

Finding 24: When discussing factors that enable agile product development, team related aspects such as cross-functional team composition and co-location are most frequently mentioned by respondents.

Finding 25: The set-up of roles within a project team is considered crucial for the success of agile project teams. Including subject matter experts in project teams and introducing and empowering product owners are concrete examples cited by respondents.

Organizational culture ranks second among the answers of respondents: It is essential that the organizational culture allows for experimentation and does not punish teams if experiments

fail. Additionally, hierarchical organizational cultures and a top-down mentality slow down product development. Therefore decision-making responsibility needs to move from committees to project teams who know best which features to prioritize based on customer feedback.

Finding 26: There is broad agreement among respondents that an organizational culture that facilitates experimentation and empowers project teams is essential for applying agile methods successfully.

Empowering project teams to make decisions on product features gives them the opportunity to prioritize work within their projects. However, this needs to be complemented by clear prioritization of projects within a portfolio. There is a high awareness among respondents that clear criteria need to be established to decide which projects are funded and how to avoid the crowding out of new and innovative ideas by initiatives that focus on marginal improvements of core products.

Finding 27: Prioritization of projects within a portfolio needs to consider criteria related to the novelty of ideas to achieve a balance between low-risk product improvement and high-risk innovations.

Budget and resource planning is closely connected to prioritization. Several respondents suggest that, separate budgets are provided to fund ideas that are still in an early stage of development. This budget can be used to develop prototypes and test them with customers. A larger amount of budget is granted to the project only after an idea proves successful. This also means a departure from current budgeting practices that require projects to specify the full scope of work before budget is granted for implementation.

Finding 28: Setting aside separate budgets is expected to enable project teams to quickly validate novel product ideas.

With regard to organizational structures, respondents take a differentiated view: Strong organizational structures result in silo-thinking and are therefore considered a barrier for agile methods. However, simply changing organizational structures (e.g. merging IT-development and operations departments) will not on its own positively impact the adoption of agile methods. Respondents conclude that it is rather the processes within departments and their interplay that need to be adapted to facilitate agile product development. To avoid frictions between departments, one respondent suggests outsourcing the development of prototypes for innovative products to an external firm.

Finding 29: Organizational structures play a comparatively minor role in facilitating agile innovation projects. Frictions between departments can be overcome by addressing process issues.

Finding 30: Outsourcing of the development of prototypes is a viable alternative to in-house development and has so far not been considered in the agile innovation model.

Finally, respondents see the need to establish technical preconditions to enable agile software development. Test automation, for example, requires considerable up-front investment but pays off as it supports continuous delivery and frequent product releases.

Finding 31: Companies need to establish the technical preconditions for continuous deployment of software. This has so far not been considered in the agile innovation model.

Finding 32: In sum, the enabling aspects described in the agile innovation model largely overlap with the respondents' answers. GRC issues receive the least attention.

d) How does employing agile product development methods generally impact the performance of the product development process and the products developed?

Respondents agree that products which are developed using agile methods will better fit the needs of prospective customers and will therefore be more commercially successful in the long run.

Finding 33: Respondents confirm the assumption that customer focus increases when using agile innovation methods. They see a close connection between customer focus and commercial success of products.

Most respondents cannot assess if agile product development methods will have an impact on overall costs. They assume that the highly standardized PDP is very efficient whereas prototyping might be expensive due to multiple iterations. Several respondents emphasize that sunk costs can be avoided if product ideas are validated early in the process and features are prioritized according to customers' needs. In any case, it is business value rather than costs that should form the basis for the evaluation of a product's success.

Finding 34: Contrary to the assumptions of the agile innovation model, most respondents do not list overall cost savings among the major benefits of agile methods. However, they assume that potential sunk costs are avoided.

Only a minority of respondents mention that using agile methods positively impact upon time-to-market. When introducing agile methods, it might even slow product development

down because the organization needs to adapt. Agile methods will only reduce product development times if prototyping is well established in the organization.

Finding 35: There is no uniform opinion among respondents if agile methods speed up the product development process.

5.4.3 Transitioning towards Agile Innovation

The third part of the interview focuses on the transformation process of companies that want to move from a stage-gate product development process towards agile innovation.

a) If an organization would attempt to change product development processes towards using agile innovation methods, how would you personally approach this transformation? What steps are necessary to introduce agile innovation methods and who are the key actors who need to be involved?

Respondents uniformly agree that a step-by-step approach is essential to introduce agile product development methods successfully. They recommend selecting 2-3 projects that work according to new methods and which operate in an environment that is not governed by the existing PDP process. Furthermore, the agile methods that are used in these initial projects should be selected carefully to make sure that the magnitude of methodological change does not overwhelm the project team. The introduction of new methods can be supported by trainings where applicable, but large-scale training programs should be avoided until specific methods have proven to be successful in practice. Several respondents emphasize that it is essential to select project teams carefully and get the right people on board: teams should include employees with prior experience in agile methods or new members of staff who are not firmly rooted in the existing processes. These team members ideally self-select to participate in these projects.

Finding 36: The majority of respondents focus on conducting pilot-projects when introducing agile methods. One respondent explicitly refers to Kotter's eight-stage change process as a blueprint for this transformation.

Finding 37: Team management aspects are frequently mentioned as important enablers for these pilot projects: Teams need to be prepared in terms of skills and team members should be selected based on their prior experience and their mindset.

Besides selecting 2-3 agile-test projects, respondents emphasize the need for broad communication with all departments to win support and explain why change is needed. Key actors include the executive management team and selected heads of department, particularly

in marketing and IT. Several respondents point to the crucial role of the CFO who oversees budgeting processes and forecasts. Key actors and supporters can also be found in non-obvious units of the organisation such as Accounting and Controlling: If prototypes are implemented to validate business ideas, sunk costs are avoided and large CAPEX-investments do not need to be written off.

Finding 38: Key actors for the change process come from all parts of the organisation, but marketing and IT are particularly important drivers of change.

b) How does your organizational unit need to change in order to introduce these practices?

The answers of respondents to this question reflect the holistic nature of the change that is necessary to introduce agile product development: Depending on their functional area, respondents focus on building up the necessary methodological skills or integrating agile methods into product development processes. Several respondents emphasize that a distinction between regular projects based on the stage-gate process and agile projects needs to be introduced because the current one-size-fits-all approach is insufficient. Several respondents also explicitly mention the role of product managers who need to take on the role of product owners and must to be empowered to make final decisions about a product's features. Supporting roles such as dedicated innovation facilitators are considered helpful in adopting agile methods.

Finding 39: The company's current one-size-fits-all approach to product development is considered a major area where change is needed. Respondents would like to see a clear prioritization and differentiation between product improvements and innovation as part of this change process.

Finding 40: Supporting roles such as innovation facilitators are suggested by respondents to enable the adoption of agile methods.

Relating to the soft factors, cultural change is the most prominent aspect mentioned by respondents: teams need to be empowered to experiment without fearing negative consequences when experiments don't show the expected results. Silo-thinking needs to be reduced to enable the prioritization of features that are based on customer needs and not on requirements of departments.

Finding 41: In accordance with the agile innovation model, respondents consider changes in the culture of the organization as particularly important: failure-tolerance and the reduction of silo-thinking are among the most frequently mentioned aspects.

Finding 42: In sum, respondents report that change is needed in virtually all areas discussed in the agile innovation model. This supports the assumption that broad based change is necessary in this particular organization to introduce agile innovation.

c) What are critical success factors and barriers to the adoption of agile innovation in general and in your organizational unit in particular?

Respondents uniformly agree that cultural aspects are the biggest barriers to the introduction of agile product development methods in their organization: fear of failure, perfectionism and reluctance to experiment are strong traits of the current corporate culture. This prevents developing MVPs, prototyping and conducting experiments.

Finding 43: The current corporate culture is considered the single biggest barrier to adopting agile methods.

Respondents are very aware that these cultural aspects are a result of how the company is currently governed and managed: Performance targets don't support the development of prototypes but the fully-fledged implementation of near-perfect products. Processes focus on including requirements from all departments instead of prioritizing them based on customer needs. One respondent also emphasizes the interplay between the idea generation phase and implementation: During idea generation, there is generally a higher flexibility to test new methods but as soon as software needs to be implemented, existing processes are applied by default and flexibility is lost.

Finding 44: In this particular organisation, barriers to the introduction of agile methods mainly exist in the form of established processes and performance targets.

d) Do you have any concrete recommendations for your organization with respect to introducing agile innovation methods?

Respondents generally observe that the organization currently becomes more aware of the insufficiencies of existing product development. This is considered a positive sign and respondents believe that broad discussion on necessary changes can be initiated. Additionally, raising the sense of urgency by communicating the need for change and formulating a common change vision is considered essential for the organization to induce change.

Finding 45: Urgency for change can further be raised by formulating and communication a vision about how the company should approach the challenge of developing innovative products.

Most respondents recommend trying out agile product development methods with 2-3 projects to get the change process started. They are aware that success needs to be visible early on to win more support.

Finding 46: Respondents largely take a hands-on-approach and recommend trying out agile methods in 2-3 projects.

5.5 Integrating Empirical Findings into the Agile Innovation Model

The following section integrates the empirical finding described in chapter 5.4 into the agile innovation model. Based on the findings of the case study, the core and supporting elements of the agile innovation model are complemented and the description of the transformation process is detailed. The following chapter highlights those findings that result in amendments of the agile innovation model.

5.5.1 Core Elements

In general, the empirical research confirms the assumptions about the core elements of the agile innovation model (Finding 10, 17, 18, 21, 22). Respondents stress that it is essential to integrate customers into product design (design phase), test prototypes with customers to collect their feedback (testing phase) and use software development methods such as Scrum to develop products (acceleration phase). Respondents are also aware that there is a close interconnection between business and technological aspects of product development and that the product development process needs to connect these elements (Finding 9, 16).

Regarding the design phase, the agile innovation model focuses on working with lead users to understand customer needs. The case study shows that the knowledge and experience of lead users can be complemented with other sources such as trend workshops to get a holistic picture of both concrete customer needs and long-term trends (Finding 23).

Amendment 1: To get a holistic picture of customer needs and long-term trends, other methods for idea generation such as analysing consumer trends can be integrated into the design phase.

Regarding the acceleration phase, the agile innovation model describes relevant software development methods (Scrum) and capabilities that are necessary to iterate and release

frequently (continuous integration and delivery). Respondents confirm the validity of the choice of methods in the agile innovation model (Finding 11). However, the agile innovation model assumes that these capabilities need to be built in-house to be used in product development. It has so far not considered the possibility of outsourcing the technical implementation of products (Finding 30). Respondents suggest that development can also be outsourced, especially for projects that are independent from legacy systems.

Amendment 2: Software development can be outsourced for selected pilot projects to increase flexibility and test agile methods.

No matter if software development is outsourced or not, empirical findings suggest that independence from legacy systems makes it easier to test prototypes with groups of customers (Finding 19). But as soon as the number of customers rises, scalable processes (e.g. sales and service) need to be provided. At this point in time, re-integration with existing systems and processes is necessary. Therefore, re-integration of successful new products into legacy systems should not be neglected and needs to be planned well in advance (Finding 20).

Amendment 3: Before the software development for new products is started, basic requirements for re-integration into legacy processes and systems need to be defined. This makes it easier to serve a high number of customers once the product becomes commercially successful.

What the general impact of agile innovation methods on product development is concerned, empirical research only partly confirms the assumptions of the agile innovation model. Whereas it is assumed that customer focus and long-term commercial success of products increases, assumptions relating to cost reductions and faster time-to-market were not unanimously confirmed in the case study (Finding 33-35). This leaves room for further research.

Amendment 4: The assumptions that agile product development methods decrease costs and speed up time to market need to be validated by further research.

5.5.2 Supporting Elements

The supporting elements described in the agile innovation model largely correspond to the aspects mentioned by the respondents. Organizational culture, team management and portfolio planning are considered most important, whereas organizational structures and GRC aspects receive less attention (Finding 24- 29, 31).

In portfolio planning, prioritization of projects and selection of agile pilot projects are regarded as key challenges: Respondents voice dissatisfaction with one-size-fits-all approaches and suggest introducing a distinction between those projects, that are suitable for using agile methods and those, that continue to work with traditional models (Finding 27)

Contrary to the core assumption of the agile innovation model, respondents suggest using agile methods also for product developments in the core business of the company, not just for innovative products that address new fields of business (Finding 17). Therefore, other criteria need to be found to identify those projects that might benefit from using agile methods.

Amendment 5: For the selection of agile projects during portfolio planning, criteria need to be developed that help to identify those projects, which are suitable for agile product development. Besides distinguishing between Horizons 1-3 in portfolio planning, the planning process also needs to integrate those criteria.

The supporting elements of the agile innovation model address various preconditions that need to be in place to conduct agile product development projects successfully. However, besides organizational preconditions such as portfolio planning, selecting appropriate success metrics and adapting budgeting processes, there are also technical preconditions that need to be established. For example, building the technical capabilities to conduct automated software tests requires considerable up-front investment and preparation (Finding 31). These technical preconditions have been neglected in the model.

Amendment 6: Technical preconditions such as test-automation and the capability to deploy quickly and frequently need to be considered in the agile innovation model as part of the supporting elements.

5.5.3 Transitioning towards Agile Innovation

The empirical findings strongly support the assumption that a transformation process towards a more flexible product development approach needs to be initiated in this particular organization (Finding 1-5). Respondents see a need for change relating to all elements of the agile innovation model (Finding 42) with particular focus on enabling elements such as culture and team management (Finding 41, 37).

In the transformation towards agile product development, the respondents strongly focus on a hands-on-approach and suggest trying out agile methods in 2-3 projects and demonstrating first successes on the way to broader change (Finding 46). Additionally, they are aware that

top-management attention is key for the success of these projects, particularly in marketing and IT (Finding 38). In this respect, the findings are fully in line with Kotter's change model.

To assist project teams in the early phases of the projects, respondents suggest providing innovation facilitators who help project teams to apply agile methods and consult on changes in the governance processes (Finding 40). Kotter (2012) does not specifically discuss change facilitators but in the case of agile innovation, these facilitators might act as change agents that support skill-building.

Amendment 7: Create the new role of innovation facilitators to support the initial 2-3 pilot projects. External help can be sought if appropriate.

6 Discussion and Conclusion

The final chapter of this thesis provides a summary of the previously presented content and discusses the thesis' contributions to research and practice. Finally, a set of concrete recommendations for the company that was studied in the empirical part is presented.

6.1 Summary

Innovation, agility and change management are the dominant themes of this thesis. To make these rather abstracts terms tangible for firms, this thesis proposes an agile innovation model that describes concrete methods and tools that accelerate product development and increase customer focus. It provides a holistic view on product development by highlighting the critical interdependence between agile product development methods that have either technical or business origins and combines them into one methodological framework.

As a base for the development of the agile innovation model, chapter 2 introduces concepts and terms from relevant and up-to-date literature and highlights the gaps in current research. It is shown that there are valuable methods and tool that provide a clear value-add to agile product development. However, they are largely isolated in their domains of design, software engineering or open innovation. Lean product development is the concept that comes closest to integrating multiple domains in one approach.

Subsequently, chapter 3 describes the agile innovation model itself. The model combines methods and tools from all aforementioned domains and consists of a core innovation process (core elements) and the necessary preconditions that need to be in place in an enterprise to successfully implement it (supporting elements). The innovation process is structured along the three phases of (1) design, (2) test and (3) accelerate. The supporting elements include (1) portfolio planning, (2) financial management, (3) metrics, (4) governance, risk, compliance, (5) team management and (6) organizational culture. The description of the model's core

elements illustrates the need for close cooperation between all business units that are involved in product development. This is even further reinforced in the supporting elements that focus on creating an environment conducive to innovation.

Chapter 4 discusses the transformation towards agile innovation. Large organizations frequently face barriers like hierarchical corporate cultures, strictly linear product development processes and lack of customer involvement in product development when they attempt to adopt agile methodologies. Therefore, a structured transformation approach is needed to overcome these barriers. Kotter's eight-stage change process is used as a blueprint to describe the transformation towards agile innovation.

The empirical part of this thesis in chapter 5 validates both the agile innovation model and the transformation process. For this purpose, qualitative research is conducted in an Austrian telecommunications company. The results are used to assess the validity of the agile innovation model and amend it based on the respondents' practical experiences. The qualitative research supports the overall validity of the model and results in seven amendments to individual elements of the agile innovation model, which increase its applicability in practice. Generally, the case study confirms that focusing on the innovation process alone is insufficient to produce effective change. Innovation methodologies are deeply interlinked with other elements of corporate governance and are embedded in a corporate culture that influences the organization's ability to innovate.

6.2 Contributions to Research

This thesis contributes to research on innovation and product development in two ways: Firstly, it describes a holistic methodological framework that focuses on new product development and combines existing approaches from areas such as business model development, lean product development and agile software engineering. It is not limited to the core innovation process, but also explicates important enablers that support the adoption of agile methodologies within an enterprise. The agile innovation model thereby complements and extends existing approaches.

Secondly, the thesis describes a structured approach to transitioning towards agile innovation methods in an organization. It draws on findings in the field of change management to addresses a challenge that many established organizations face: transitioning towards agile innovation from existing stage-gate processes. This aspect is neglected by many other

publications that focus on the introduction of individual methods and their advantages for product development.

The agile innovation model itself and the empirical research in this paper have several limitations that provide guidance for further research. The agile innovation model was designed to support the development of software products. Therefore the methods described in this model might be of limited use to companies in other industries. Future research ought to adapt the agile innovation model for the development of non-digital products.

For the purpose of this thesis, the agile innovation model has been empirically investigated in the form of a qualitative case study in one Austrian corporation. To reinforce the findings, future empirical research can be extended to a higher number of companies in a wider range of industries. This refers particularly to the assumed positive effects on product development such as decreased costs and faster time to market. Quantitative studies would add new insights, e.g. relating to the relative importance of individual elements of the model. The sample company studied in the case is a large corporation with several thousand employees. Empirical research therefore can be extended to study small- and medium size businesses and the specific characteristics of their innovation processes.

Theoretical research on agile innovation can be advanced by placing the model in a broader context: the concept of ambidextrous organizations described in Raisch et al. (2009) provides a basis for research on the balance between agile and traditional product development approaches within a company. Finally, looking at the contribution of agile product development to creating transient advantages as described by McGrath (2013) constitutes an interesting field for both theoretical and empirical research.

6.3 Recommendations for Implementation

The final section of this chapter addresses key challenges faced by the Austrian telecommunications firm, which has been analysed in chapter 5. The following seven recommendations synthesize the empirical findings and extract concrete suggestions for the implementation of agile product development in this particular organization.

1. **Create a change vision linked to business goals**

   Despite considerable knowledge about the shortcomings of the current approach to product development, the overall picture of how products should be developed in the future is still fragmented within the organization. Therefore, a clearly formulated change vision would help to provide the necessary guidance for a broader change process

towards agile innovation. As discussed in chapter 4.3.4, this change vision does not only need to include methodological aspects, but change goals also need to be linked to concrete plans in order to improve performance in one or more areas of business.

2. **Clearly address misconceptions about agile product development in communication**
   The organization has had prior experiences with applying agile software development methods that have, from the perspective of several respondents, resulted in high costs and unpredictable project timings. Agile software development has been associated with unclear project goals, volatile costs and a high likeliness to deviate from pre-approved plans. These issues need to be addressed in communication within the company, explaining what agile product development is and what it is not to avoid misconceptions and resistance.
3. **Select 2-3 pilot projects and start generating short-term wins**
   The organization already has some experience with applying agile product development methods, but their application has so far been fragmented and limited to individual departments. The merits of agile product development can be demonstrated in 2-3 pilot projects in which agile methods are applied throughout the project's duration. Ideally these projects are non-critical to the overall success of the company, relatively independent from legacy systems and comparably small in scope. The concrete methods, which are applied in these projects, need to be carefully selected in order not to overwhelm the project team.
4. **Enable prototyping**
   The organization currently struggles with prototyping for cultural as well as for capability-related reasons. Therefore, creating various forms of prototypes (marketing collateral, MVPs, functional prototypes, etc.) and testing them with customer requires particular attention within the pilot projects. If prototypes cannot be implemented by the existing organizational units, outsourcing of software development is a valid option.
5. **Define criteria to prioritize projects and change metrics that measure success**
   If agile product development methods should be applied on a broader scale, the organization needs to define the criteria, according to which it selects and prioritizes projects and measures their success. The current portfolio planning approach, which uses business value as a basis for prioritization, is a good start. However, innovative projects that operate under high uncertainty relating to the size of their target market are likely to be crowded out when allocating resources. For these projects, success might initially be defined as establishing a product/market-fit rather than realizing business value.

6. **Skill-building: Translating customer needs into product features**
   Product development is currently very focused on specifying product features and too little time is allocated to understanding customer needs and translating them into product features at the beginning of a project. Project teams would benefits from methodological help in this initial project phase. Conducting lead user workshops and translating the findings into customer profiles, value maps and business models requires methodological knowledge that can be provided by innovation facilitators.
7. **Transition from a project- to towards product-centred approach**
   Product development is currently conducted in the form of projects, which typically end after the product is launched. In the long run, the company should reassess this approach as it limits the responsibility of teams to the duration of one particular project. After that, the line organization takes over and the knowledge that the project team has accumulated is partially lost. A product-centred approach in which project teams continue to work on a particular product after its launch avoids this loss of knowledge and ensures continuity in lifecycle management. It therefore might be particularly valuable to test this approach for products that are not part of the core business of the company and that have just tapped into new target groups or markets.

6.4 Conclusion

Both theoretical and empirical research show that it is essential for organizations to consider multiple perspectives when introducing agile product development methods. Besides focusing on the core product development process, organizations need to adopt an enabler perspective to have a more comprehensive understanding of how to support the adoption of agile innovation in their organization. Paying close attention to these facilitating factors and using a structured approach to transformation will lead to a smoother adoption of agile practices, enabling organizations to develop innovative products that meet customer needs.

Within the core innovation process, experimentation and prototyping have shown to be essential in meeting customer needs. Several methods of the agile innovation model stress the necessity to develop multiple prototypes within the course of a project and the need to obtain rapid feedback from customers. The importance of prototyping was also reinforced by empirical research. However, prototyping is not only a methodological issue, but a cultural issue as well. Large companies tend to have organizational cultures that focus on stability and predictability. This creates additional barriers for the adoption of agile methods. Therefore,

removing cultural barriers is essential within the transformation process towards agile innovation.

Large companies need to become more comfortable in dealing with the risks associated with innovation in general and prototyping in particular. Innovation is inherently risky, therefore it is more important to manage this risk instead of trying to avoid it. The portfolio management approaches discussed in the agile innovation model provide a starting point to obtain a well-balanced portfolio. This portfolio does not crowd out innovative initiatives within a corporate culture that focuses on short-term financial goals and furthermore fears the cannibalization of today's revenues.

In sum, the agile innovation model shows that companies can actively plan for innovation. However, large companies do not easily adapt to become leading innovators. Those who attempt this transformation, often enter into a multi-year change process that touches large parts of the organization. The agile innovation model provides guidance for companies that would like to approach this challenge in a holistic and structured way.

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