



Innovation Management Along the Life-Cycle Stages of a Company

A Master's Thesis submitted for the degree of
"Master of Business Administration"

supervised by
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Salzburg, 22. July 2018



Affidavit

I, **Alfred Paris**, hereby declare

1. that I am the sole author of the present Master's Thesis, "Innovation Management Along the Life-Cycle Stages of a Company", 65 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
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Vienna, 22.07.2018

Signature

To my wife My,
and my sons
Phileas and Julius.

1 Preface

1.1 Abstract

Innovation management looks different in a start-up company than it does in a large, multi-national enterprise. This thesis analyzes the evolution of innovation management throughout the life-cycle of companies. Five life-cycle stages – existence, survival, success, renewal and decline – are studied for their implications to the elements of the innovation value chain: idea generation, conversion and diffusion. While some features are of importance in any stage, such as a corporate culture that supports creativity, risk-taking and entrepreneurial behavior, as well as the need for absorptive capacity to take-in external knowledge, some features are specific to certain stages. A start-up needs innovations that help commercialize the initial product for market-entry and has to shelf other ideas for later, creating the need for an idea repository. Growing companies have to develop innovation strategies and foresight policies, as well as processes to govern new product development (NPD), e.g. by introducing Stage-Gate processes. Large companies have to tackle the challenge of complexity, operating in various regions and markets, and must actively enforce the inter-departmental communication; but they have options like structural ambidexterity or formation of spin-off companies. Beyond these seemingly self-evident observations, this thesis provides a sort of “navigation system” for growing companies in order to set the right priorities at the right time and stay innovative throughout the life-cycle.

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1.6 List of abbreviations

- NPD New product development
- IMS Innovation management system
- HQ Headquarters
- MNE Multi-national enterprise
- OLC Organizational Life-cycle
- RQ Research question

2 Introduction

2.1 Problem statement and relevance of research

Innovation management is a challenging task by itself. Managers have to balance risks and opportunities, develop core capabilities while remaining flexible. This fundamental paradox challenge is even intensified by the changing organizational conditions of companies throughout their life-cycle. This thesis studies the implications of changing organizational setups of companies going through various life-cycle stages to the management of innovation.

Scanning the literature on innovation management in dependence of company characteristics, it becomes apparent that most studies focus on the difference of established, incumbent, large companies versus newly founded, non-incumbent, small start-ups (e.g. Chandy and Tellis, 2000; Christensen, 2003; Freeman and Engel, 2007). While this comparison teaches important lessons, it does not help for designing and maintaining an innovation management system (IMS) while growing (i.e. attempting to grow) from small to large. Figure 1 compares the scopes of these studies. A study might describe situation (a) where the (already) large Company 1 competes with newly-founded, small Company 2. Later, Company 2 might have grown and be facing competition from another, newly founded venture Company 3, which is shown as situation (b). This work is concerned with (c), the trajectory of a company from small to large, and how to maintain the innovative edge along the way. (It should be noted that the depicted linear growth with fixed growth rate is a simplification for the chart but is not expected in real-life companies.)

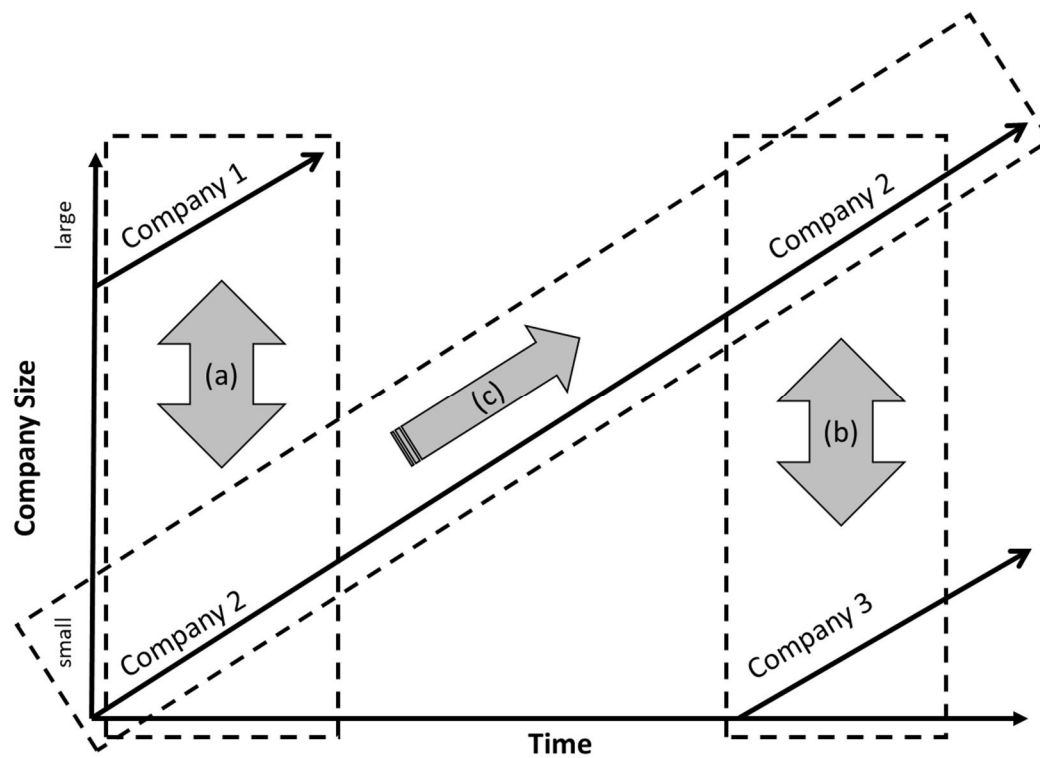


Figure 1: Scope of studies on innovation – Studies (a) and (b) compare small to large companies; (c) This thesis follows company 2 as it grows from small to large. (Own illustration)

For describing the organizational challenges for growing firms, a number of models have been proposed, many of which are proposing some sets of phases or stages (e.g. Greiner, 1998; Galbraith, 1982a; Lester et al., 2003). However, those models describe general management issues but do not specifically address innovation management. For a company that wants to base its success on constant innovation, it will be crucial to adjust its innovation management system according to the changing conditions. While start-up companies may be tempted to rely on an innovative culture with very little structure, when companies grow the management must go lockstep; and if they spread out to different locations and/or acquire other companies with different cultures, new challenges arise and more elaborate management systems will be required.

The results of this study shall help managers of growing companies in designing appropriate innovation management structures. Managers that want to grow their business will always face issues related to growth and have to cope with them. Management systems that work for small firms will have to be adjusted once they grow, and the same applies to the management of innovations. For any company that puts

innovation into the center of the strategy in order to stay competitive under rapidly changing environments, it is useful to take a look ahead to anticipate the challenges and not be taken by surprise. Managers might also find it helpful to get simple, actionable advice how to tackle expected problems.

General literature on innovation management rarely considers the changing challenges that arise from company growth, at least not in a consistent way. For example, start-up companies that have successfully navigated the difficult launch phase and are on a stable growth trajectory may have to install additional management structures for maintaining their innovative edge. Small- and medium enterprises (SME's), that make up a considerable part of many economies, may find it hard to relate to either young start-up models for innovation on the one side or corporate innovation programs on the other side, and need to find their middle ground. Further down the life-cycle, companies may have successfully conquered a specific market sector but may find it difficult to branch out into different sectors. Even larger companies of global reach have to manage the complexity of multi-regional markets and still have enough innovative endeavor to remain competitive. And in some cases, the profits may decline and urgent action may be required, and in such cases innovation could be a critical success factor to enable the turn-around.

The premise of this work is that companies that grow from small to large face similar challenges that are inherent to the growth process. These challenges provide the boundary conditions for the management systems, in particular the innovation management system. It is also presumed that the expected challenges can be countered or mitigated by specific organizational features.

Of course, this does not imply that there is a "one size fits all" solution or a simple step-by-step instruction that will make the company successful. However, this work attempts to provide advice grounded on theoretical research and proven to work by empirical evidence.

2.2 Research questions

This thesis studies how innovation management changes for a company while it goes through its life-cycle, i.e. from start-up to growth to some stability, re-configuration and possibly decline. The over-arching research question is:

Main Research Question: How does innovation management change over the course of a company's life-cycle?

This main research question is sub-divided into the following two specific research questions:

Research Question 1 (RQ1): What challenges are expected to be relevant for the design of an innovation management system in each stage of a company's life-cycle?

Research Question 2 (RQ2): What are recommended features of an effective innovation management system in each stage of a company's life-cycle?

2.3 Contribution

As mentioned above, extant literature does not provide a consistent view on innovation management throughout the life-cycle of a company. This thesis aims to close this gap of research to provide a consistent framework of innovation management throughout the company's life-cycle. The study topic of this thesis combines two research disciplines, organizational development and innovation management.

The research questions of this thesis have relevance for the organizational sciences studying the development of companies in the course of time, and how innovation is managed along the way. For example, Koberg et al. conclude that "Researchers who study innovation should consider including life-cycle stage as a potential moderating variable" (Koberg et al., 1996). Start-up companies don't become large over night, and there may be crucial decisions in the middle ground, e.g. for small and medium enterprises (SME's).

In addition, this work is also of relevance for management practitioners involved in the design of innovation management systems in growing companies. As growth is at the heart of commercial success, and many companies base their strategy on innovation, it is useful to understand the boundary conditions and challenges that are to be expected and how to resolve them.

2.4 Research structure

The research questions stated above are approached as follows.

First, a brief review of literature that focuses on innovation management considering company size and organizational setup is provided in chapter 3. The definition of innovation is reviewed to provide the context for this thesis in section 3.1. Further, it is shown that innovation contributes to positive business growth in section 3.2. Section 3.3 shows the important role that a company culture plays for continued innovative success. Finally, some exemplary works that connect innovation management to company size and organizational design are being reviewed in section 3.4.

For the answering the research questions, a framework of innovation value chain and life-cycle stages was developed, which is explained in chapter 4. At first the general outset of life-cycle models is explained, then the specific life-cycle model used in this thesis is explained and justified in section 4.1. Section 4.2 features the innovation value chain that is applied in this work. Section 4.3 deals with the restrictions and critique to stage models and explains why the use of such a model still makes sense in this context.

The developed framework is applied and the life-cycle stages are studied in detail in chapter 5. After a general introduction, each life-cycle stage is treated in each own section with the same structure, where after a brief description, the challenges of innovation management are elaborated and finally recommendations to cope with those are provided.

Finally, chapter 6 provides the summary and discussion of results. Condensing all recommendations derived in chapter 5, especially in Table 7, provides additional insights that are elaborated in section 6.1. Section 6.2 considers the limitations of the research and finally section 6.3 provides the conclusion and an outlook to future studies.

3 Review of the literature

3.1 Innovation

Innovation has been defined in a number of ways, however, two important aspects are always included: The notion of “newness” and the factor of “implementation”. Innovations have to be new (if not genuinely new, at least new to the customer group it is offered to). On the other hand, just an idea or invention by itself will not be sufficient to constitute an innovation, it also has to be implemented to be used, e.g. brought to the market and sold to generate revenues. Thus:

“Innovation is the management of all activities involved in the process of idea generation, technology development, manufacturing and marketing of a new (or improved) product or manufacturing process or equipment.” (Trott, 2012)

In the context of this thesis, the focus is on **product and process innovations** as opposed to organizational or service innovation, business model innovation or marketing innovation. These product and process innovations are considered as factors contributing to the growth of companies, and are considered to be strongly based on technological innovation.

Another dimension of relevance is the degree of newness. Many innovations aim at improving an existing product or service (or production process), by improving the performance attributes, adding functionality, improving convenience, or reducing the cost. Those innovations are referred to as continuous or incremental or **sustaining innovations**. Whereas some innovations are more radical in nature, making something possible that beforehand was not available. **Radical innovations** refer to dramatically new technological developments that may have the potential to disrupt current markets. Christensen coined the term **disruptive innovation** for such events (Christensen, 2003), and Figure 2 explains the concept.

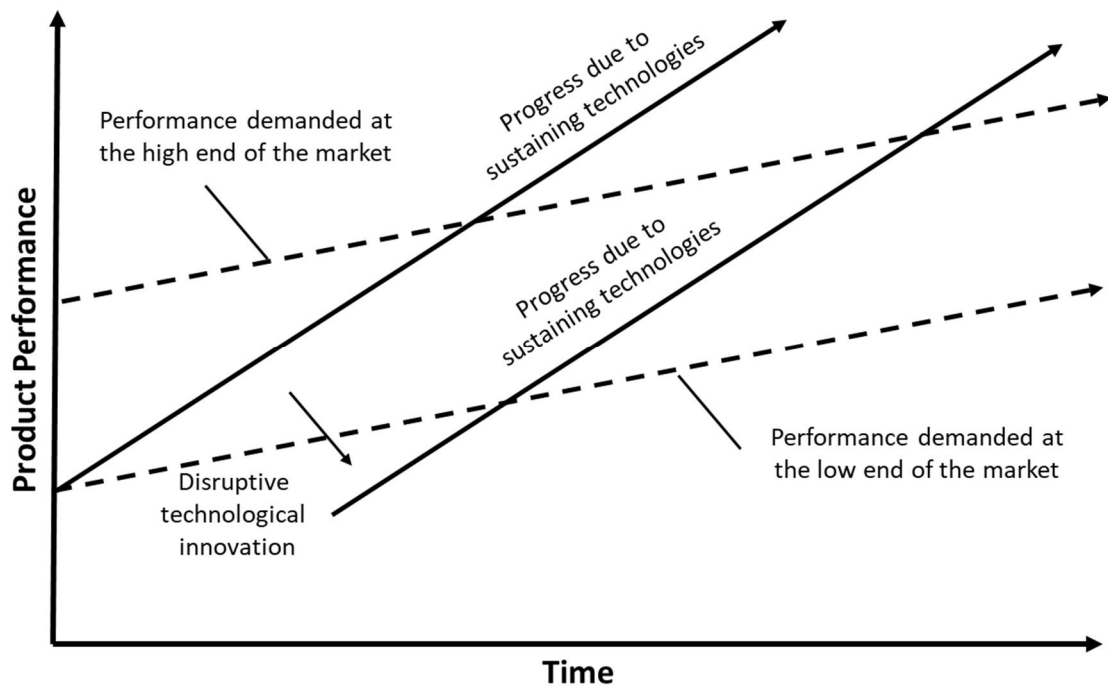


Figure 2: Disruptive technological innovation (Christensen, 2003)

While sustaining innovations will improve product's performance to address the needs of ever higher demands in the market, from the low end to the high end, thus expanding the customer base, disruptive technologies very often start at a point where they offer basically inferior functionality but provide a very specific feature in a way that attracts new customers, or sometimes is just so much cheaper than what is available yet good enough for some to be bought. By applying sustaining improvements to the new technology, they finally enter the mainstream market and may eventually displace incumbents, thus disrupting them. (Christensen, 2003)

3.2 Innovation as growth driver

Coad summarized the impact of innovation to company growth: *"Successful innovation enables firms to become more productive, generating an increase in output while lowering the requirements of inputs."* Focusing on the resulting sales growth (as opposed to an employment growth), he finds that *"[...] while innovation is not very important in explaining the growth of the average firm (which doesn't grow very much), innovation is of crucial importance for a small number of fast-growing firms."* (Coad,

2009) In other terms, a start-up that wants to grow fast, must bring something new to the table in order to attract sales from incumbents.

Tushman and Anderson (1986) empirically concluded that firms that initiate major technological changes grow more rapidly than other firms.

3.3 The role of company culture

There is broad consensus that the basis for sustained innovative success is the creation of an innovation friendly company culture (see e.g. Denison, 1984). Most authors agree that culture can be defined as a set of norms, attitudes, values, and behavior patterns that form the core identity of an organization or operating unit (Denison, 1984), and it plays a key role in determining the working climate, leadership style, strategy formulation, and organization behavior and processes of the firm (Saffold, 1988). (Brentani and Kleinschmidt, 2004)

A company culture that fosters innovation should emphasize the learning, often by playful experimentation and creative combination, thus requiring some freedom for employees. Entrepreneurship and risk taking should be encouraged and rewarded, and failure must not be punished. A climate of open and informal communication is characteristic.

In order to assess how innovation-friendly the company culture actually is, Rao and Weintraub have identified six building blocks that have to play together (Rao and Weintraub, 2013):

- **Values:** drive priorities and decisions. Innovative firms value entrepreneurship, encourage creativity and continuous learning.
- **Behaviors:** describe how people act. This includes active motivation of employees to experiment, support in case of difficulties, and decisions to have new products cannibalize old ones.
- **Climate:** is the tenor of workplace life. Innovative climate encourages learning, risk taking and independent thinking.
- **Resources:** comprises people, systems and projects. “Innovation champions” might help to shape the organization’s values and climate.

- **Processes:** describe how innovations are managed, including the “innovation funnel”, stage-gate systems or other procedures for review and prioritization.
- **Success:** will help to reinforce the values, behaviors and processes that have positive impact. It may be recognized on personal level, on enterprise level or by external recognition.

The last three building blocks, resources, processes and (measurement of) success, are more tangible and are thus easier to quantify and describe. However, the first three, values, behaviors and climate are more on the “softer” side but are nonetheless important. Finally, those are the ones that are more difficult to change, as they are shaped by the history and the joint experiences of the company and its employees. However, by assessing the company culture broken down into these elements, weak spots may be identified and actions for improvement may be devised (Rao and Weintraub, 2013).

Several studies have confirmed the positive relation of a strong company culture to innovation success. For example, a study by Brentani and Kleinschmidt (2004) on 252 international new product development programs confirms the importance of a culture that emphasizes the role of innovation. The behavioral environment factor of “Innovation/Globalization Culture” had most significantly positive impact to the innovation success, both in terms of success rate as well as financial contribution. This factor captures the attitude toward international new product development within the firm; the extent to which management supports innovation positively; and whether the firm tries to create a “truly international” innovation culture throughout the worldwide organization. Further two important factors are “Resources Commitment” and “Top-Management Involvement”. The firms that set themselves apart by extraordinary success employ a “Positive Balance” of all three success factors. (Brentani and Kleinschmidt, 2004)

3.4 Organizational design to support innovation

In order to understand how innovation management should be adapted when a company goes through its life-cycle, it is important to understand the key elements of a successful innovation management system. On top of general literature on innovation

management, some works provide specifically useful insights and recommendations. Those are reviewed in this section.

Galbraith provides general advice how to “design the innovating organization” (Galbraith, 1982b). He contends that “*organizations that want to innovate or revitalize themselves need two organizations, an **operating organization** and an **innovating organization**. In addition, [...] they need a **transition process** to transfer ideas from the innovating organization to the operating organization.*” (Galbraith, 1982b, emphasis added). Furthermore, he emphasizes that “*the innovating organization [...] is the combination of idea people, reservations in which they can operate, sponsors to supervise them, funding for their ideas, and rewards for their success that increase the odds in favor of innovation.*” (Galbraith, 1982b) The components of such an innovating organization are shown in Figure 3.

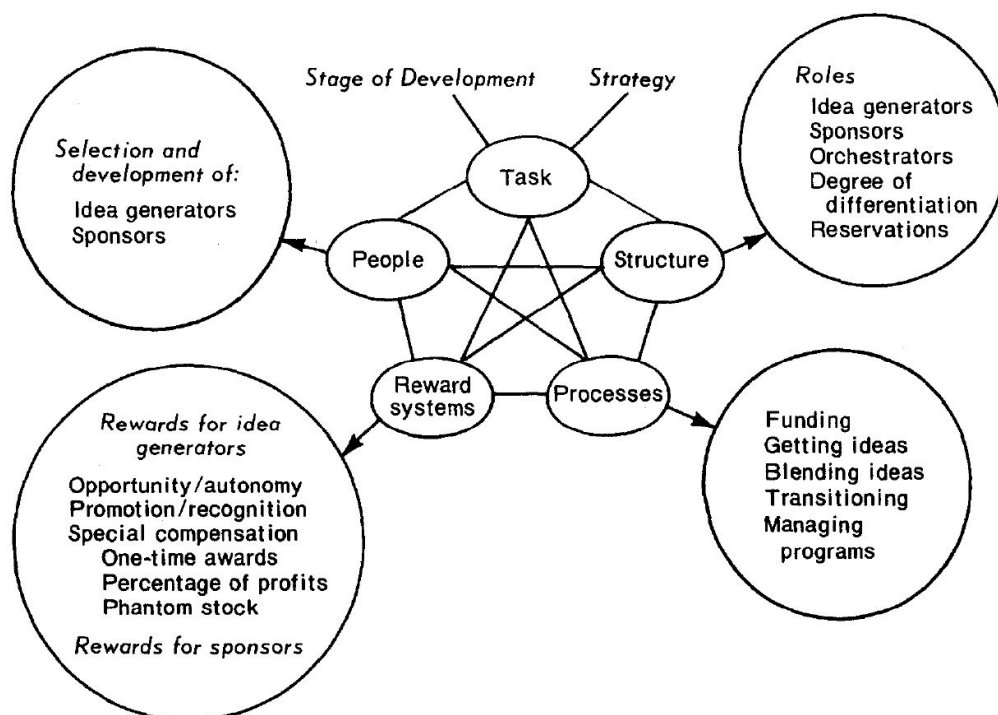


Figure 3: An innovating organization's design components (Galbraith, 1982b)

Whether or not the innovative organization is separate from the operating organization, established companies face the paradox challenge that the very core capabilities they have earned so far at the same time may inhibit the innovation process and act as core

rigidities. (Leonard-Barton, 1992) As this concept lies at the heart of the management challenge companies have to face (except the freshly inaugurated start-up, that has no history to draw upon), this concept is briefly reviewed.

A **core capability** (also referred to as core competency) can be defined as “a set of differentiated skills, complementary assets, and routines that provide the basis for a firm's competitive capacities and sustainable advantage in a particular business”. (Teece et al., 1990) In short, a core capability is a knowledge set that distinguishes the company and provides a competitive advantage. The definition including the competitive advantage indicates that its determination requires to also take a look at the competition. As such capabilities are in fact intangible resources, the value can be defined by using the VRIN framework, saying that valuable resources should be (V)aluable, (R)are, (I)nitiable and (N)on-substitutable. (Barney, 1991) The capability is formed by four dimensions (Leonard-Barton, 1992):

- (1) **Employee knowledge and skills:** This is what most often is associated with a core capability and most obviously relevant to new product development.
- (2) **Technical systems:** These are the physical production or information systems that have been established along the way with accompanying knowledge and procedures.
- (3) **Managerial systems:** Refers specifically to the way how knowledge is created, like specific training programs and the respective incentive systems.
- (4) **Values and norms:** Rooted in the company culture, this dimension is infused through the other three and refers to value a company holds with respect to, for instance, type of knowledge (engineering vs. marketing), knowledge creation (systematic research vs. trial-and-error), empowerment (individual vs. hierarchy), knowledge distribution (need-to-know vs. open information) or systems architecture (open vs. proprietary).

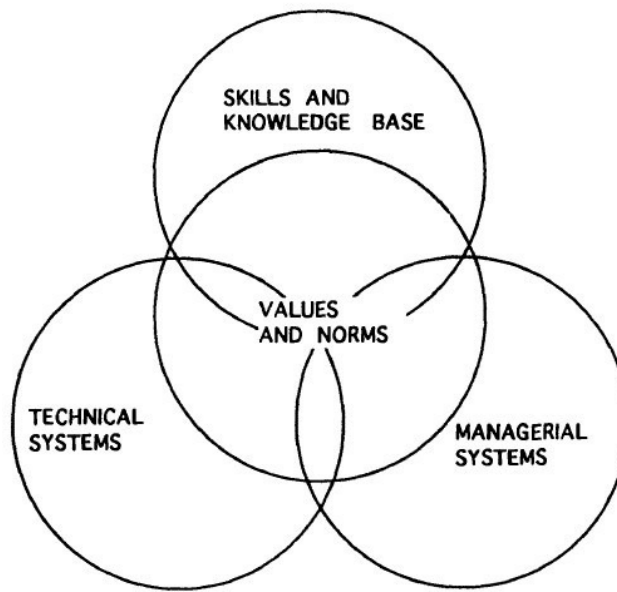


Figure 4: Four dimensions of a core capability (Leonard-Barton, 1992)

Projects that are well aligned with the core capabilities will have a better chance of success than the ones that depart in one or more of the dimensions; projects that deviate in all four dimensions will be tremendous challenges that have high likelihood of failure. In simple words, it is easier to do “more of the same kind” than to do “something completely new”. In this way, core capabilities may interfere with more radical innovation projects and thus become **core rigidities**. In order for companies not be stuck with the beaten tracks, it is important to always challenge the current state of the art.

The four dimensions vary in the ease of change, from easy to difficult in the following sequence:

1. **technical systems** are relatively easy to change,
2. **management systems** usually have a larger scope but can be changed as well,
3. the **knowledge and skill** dimension is more difficult to change because on the one hand side these are built over time and on the other hand side, much of it is tacit knowledge in the heads of the employees;
4. The most difficult dimension to change is the **values** because they are closely bound to the company culture, and culture is hard to alter in the short term.

Projects that face serious hurdles in one or more of these dimensions, might be addressed in four ways: (1) abandonment; (2) recidivism, i.e. return to core capabilities; (3) reorientation; and (4) isolation. As (1) and (2) do not implement that innovation as intended, only options (3) and (4) promise to turn such projects into commercial success.

3.5 Innovation management considering company size and organizational design

There is a wide array of literature on innovation management in general, and a full review would exceed the scope of this thesis. This chapter focuses on the works that specifically address the implications of (growing) company size to the innovation management.

Much has been written about the different challenges that small and large companies face when it comes to innovation. In order to understand the evolution of a company from small to large it will be useful to take a look at these extreme points first.

Clayton Christensen in “The Innovator’s Dilemma” (Christensen, 2003) devotes a chapter to point out the crucial differences between small and large companies. He points out that in order to maintain the same level percentage of growth, large companies need more absolute revenue to be added each year, therefore it becomes less and less possible that small markets can be viable as vehicles to achieve this. Small companies however may value the opportunity because it is large enough to support their growth ambitions.

Freeman and Engel take a look at “Models of Innovation: Start-ups and mature corporations” (Freeman and Engel, 2007) and go as far as to classify the innovation process into just two models: the corporate model and the entrepreneurial model. They assess that “*The window of time in which entrepreneurs find opportunity is based on the lethargy of their rivals, especially rivals with vastly superior resources.*” The greater the business opportunity, the faster the rivals are expected to follow up, introducing the need to grow rapidly. This in turn requires the injection of external capital, often provided by venture capitalists, who require the outlook of returns within a few years horizon. These circumstances provide the outset for the **entrepreneurial model** of

innovation. The company's structure tends to be organic and task-oriented, the leadership of the invention process usually resides with the inventors, often with the most expert and technologically sophisticated members of the team. This provides for a strong emotional attachment to the innovation and often leads to strong, self-motivated efforts to overcome obstacles, which may not be found in other circumstances. **The corporate model** is characterized by the fact that resources are available but have to be allocated, often creating a conflict between exploitation and exploration – exploiting current market and customers or exploring innovation projects. An important factor in the allocation process is the agency problem, when the interest of the individual (employee or manager) is not necessarily aligned with the interest of the owners (often shareholders) of the company. For example, inventors might have a strong attachment to their idea, even though a commercialization may not make sense in economic terms and is therefore abandoned, which might demotivate the inventors. In other cases, the innovation might be introduced from top-down, lacking the emotional attachment of the employees and might thus be implemented with less enthusiasm. When innovations are brought in from the outside, either through licensing or through mergers, the renowned “not-invented-here-syndrome” might cause obstacles in the implementation. Another factor is that the resources available to a company have to be considered constant in the short-term, meaning that resources spent on risky, innovative projects have to be drawn from less risky undertakings like expansion or improvement of existing product lines. All of the mentioned features of the corporate model account for the relative slowness of the large firm compared to a start-up, and thus provide the opportunity for entrepreneurial activity. (Freeman and Engel, 2007)

However, the corporate inertia can be countered by organizational features. The notion that large, incumbent firms rarely introduce radical product innovations, coined by the term “The Incumbent’s Curse” by Chandy and Tellis (2000), is no longer true in modern corporate world. In a large longitudinal study of 64 radical innovations it is shown that after World War II, large organizations have successfully decentralized *“into smaller, autonomous organizational units that enable the large firm to respond to and create technological innovations while maintaining their resource advantages”*. (Chandy and Tellis, 2000). Thus, they can leverage their enhanced financial, technological and market

capabilities for the introduction of radical product innovations. In order for small nonincumbent companies to develop and introduce radical product innovations, they suggest at least two strategies: *“(1) use research spillovers from more resource-rich firms and (2) actively partner with organizations with technological capabilities and financial resources they do not have themselves. Of these two options, the second may be a less imitable and more sustainable option in many industries.”* (Chandy and Tellis, 2000)

Eiriz, Fabia and Barbosa (Eiriz et al., 2013) derive a typology of innovation strategies at hand for growing companies. They identify four innovation strategies:

- **Discovery:** Create a new product or service based on a radical innovation, very often introduced by technology push.
- **Product Development:** The development of new or improved products and functions, mainly based on customer's need (market pull).
- **Learning by Experience:** Knowledge accumulation resulting from the firm's experience with existing technologies, processes, markets, and people, which may allow firm to evolve over the growth stages.
- **Restructuring:** Major changes to the firm's processes, leading to restructuring of many or all areas of the company.

Those can be applied dependent on the type of innovation and the degree of novelty, in the various stages of the company listed as start-up, expansion, maturity, diversification, and exit. The typology is summarized in Figure 5. As radical innovations are expected to happen more rarely than incremental innovations, learning by experience and product development will be in use more often than discovery and restructuring. In this regard, the start-up phase may be special because many start-up's may be specifically centered around a radical innovation and thus employing a discovery strategy. This terminology may be used when investigating the innovation strategies respective to the growth stages. However, Eiriz et al. contended themselves to suggesting to apply this typology to different life-cycle stages but did not investigate the implications themselves.

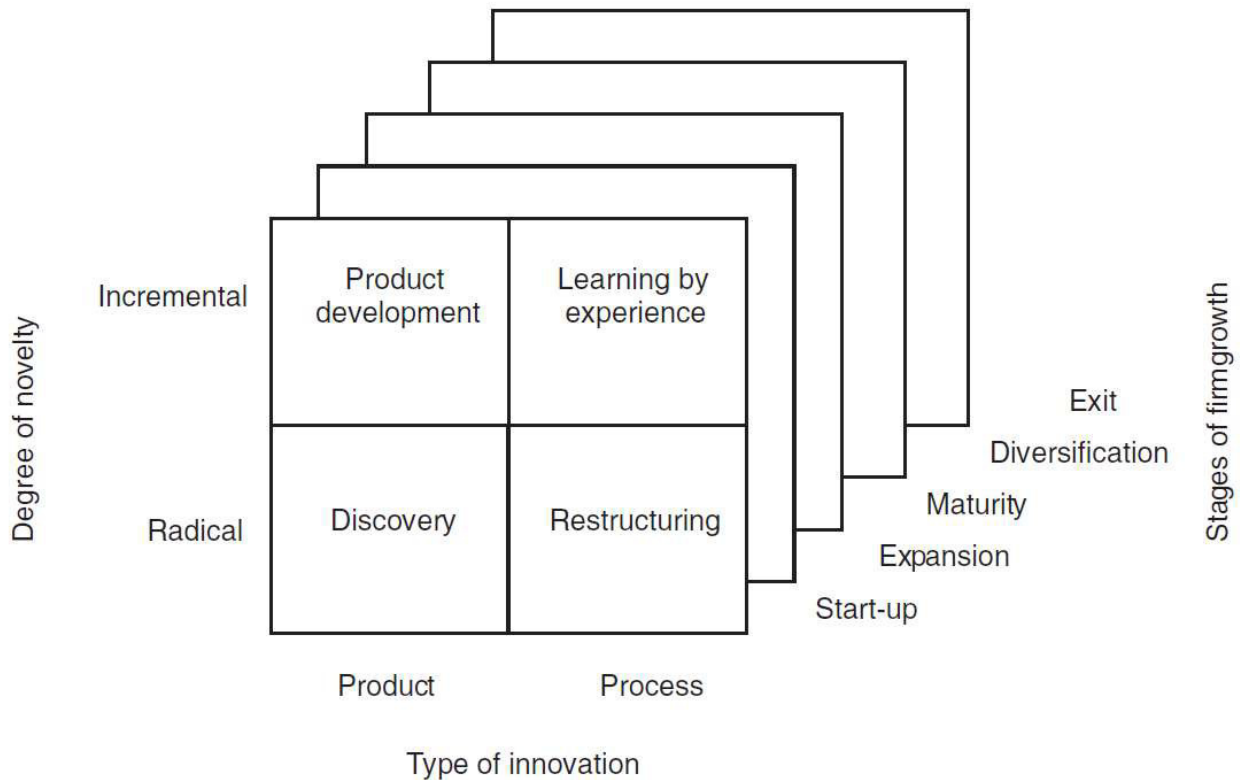


Figure 5: Typology of innovation strategies (Eiriz et al., 2013)

Koberg et al. (1996) have studied the role of facilitators to innovation considering the life-cycle stages, based on a sample of 326 US-based high-tech companies in different stages of their development. While the authors started with four stages from the Kazanjian (1988) model (i.e. Conception and Development; Commercialization; Growth; Stability), the results were later amalgamated to just discern early-stage and later-stage organizations. They confirmed that the life-cycle moderated the effect of facilitators to the firm's innovativeness. (Koberg et al., 1996) The three most significant findings were:

- Formalization had a negative association to innovativeness in early-stage organizations, suggesting that overly formal structures might inhibit the creative energy of the employees. In later-stage organizations, it has a positive, yet insignificant association. (Koberg et al., 1996)
- Stock-incentives had a stronger association to innovativeness in later stage organizations than in early stage. (Koberg et al., 1996)

- Environmental scanning was positively associated with innovativeness in both early and late stage organization, supporting the idea that innovations are strongly enhanced by information-intake from the environment. (Koberg et al., 1996)

Phelps, Admas and Bessant (2007) discard the notion of growth stages and suggest that, *“as firms grow, they encounter a series of problems [...] [that] must be successfully addressed if growth is to continue.”* They propose a model that comprises six major categories of problems, that at some point in the organizational development will reach a critical level, called ‘tipping points’. These six categories are: (1) People management; (2) Strategic Orientation; (3) Formalized Systems; (4) New Market Entry; (5) Obtaining Finance; and (6) Operational Improvement. They suggest to build absorptive capacity to overcome those issues. The framework is graphically shown in Figure 6.

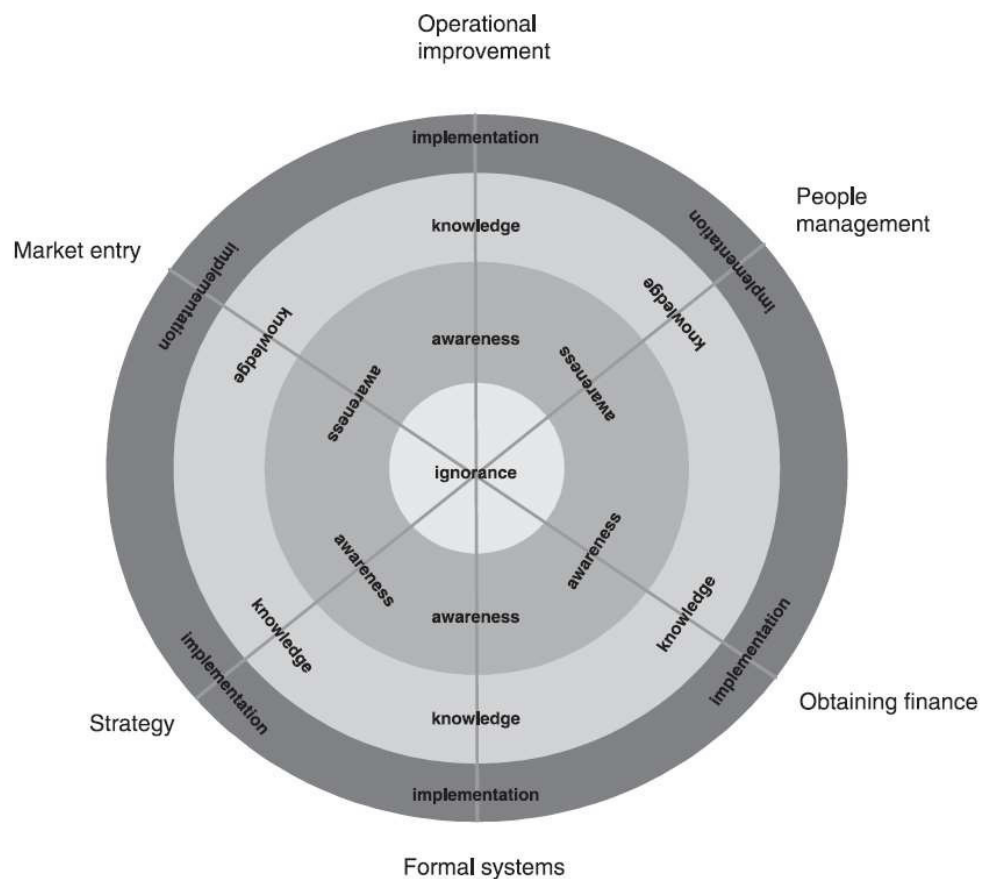


Figure 6: The absorptive capacity/tipping point framework (Phelps et al., 2007)

4 Method: The framework of innovation value chain and life-cycle stages.

In order to describe the life-cycle of companies, various descriptive models have been put forward (e.g. Greiner, 1972 and 1998; Galbraith, 1982a; Kazanjian, 1988; Hanks et al., 1994; Lester et al., 2003). In fact, between 1962 and 2006, 104 different models have been introduced, employing varying numbers of stages. (Levie and Lichtenstein, 2010) Even though companies may have very different fields of operations, producing products or providing service, some common patterns can be observed. (e.g. Lester et al., 2003)

The general notion is that companies grow from small to large in the course of time, if they (1) intend to do so and (2) are able to do so. Some company's managers may not want to grow beyond a certain size, and others may face severe obstacles to growth, whether internal or external. In this work, the focus is not on those cases but rather the analysis how to describe the trajectory from a small company to a large one. It is assumed that the small firms in question are conceived by a small number of founders, either by entrepreneurial endeavor or as a spin-off or diversion of another company, and they are often referred to as "start-ups". The large firms can be thought of as multinational enterprises (MNE's) with global footprint and several ten thousands of employees. This thesis will be concerned with the steps in-between, the necessary organizational changes that implied by growth, and the implications to the management of innovation activities.

The independent axis for growth models is almost always time. The units of measure can vary widely from months, years or even decades, dependent on the growth rate that should be shown. The growth rate of course will depend on a number of factors, the most important one being the prevailing growth rate in the specific industry the company is operating in, which in turn will depend on where in the innovation life-cycle the industry is in. The industry's market can be in development, introduction, growth, maturity or decline (Rogers, 1983); and the overall market growth will heavily influence the growth opportunities for the firm. Then of course there are a number of other factors that will influence how well the company is able to realize the opportunity, like

strategic planning and management capability, but those topics are beyond the scope of this thesis.

For the metric of the company size – on which the growth is measured – there are a number of choices available. The most obvious ones are sales volume and number of employees. The sales volume is used very often, most likely because it is a number that can be usually determined rather accurately, and is more or less easily available. Especially for publicly traded companies, this figure will be reported officially at least annually and according to fixed calculation standards, making it a good metric in order to compare companies. The sales volume however gives no indication about the efficiency that the sales can be converted into profits. Depended on the cost structure, two firms with the same sales figure might make good profits and be poised for rapid growth or might have deep losses and be close to bankruptcy.

The number of employees is also a number that can be obtained rather easily and in most instances is publicly available. For public companies, this number will also be reported. Also, the number of employees will have strongest influence on the organizational pattern that the company will employ, for example how many levels of hierarchy are introduced.

Dependent on the specific research topic, also other metrics might be used, for example the profitability might be an interesting metric for studies on organizational improvement programs, but this will be beyond the scope of this work.

As for this thesis the actual measurement of size is less relevant than the organizational form, the specific choice for the size (growth) indicator is quite arbitrary. This work uses the number of employees as the thought model, because it is most closely tied to the organizational setup of firm. In most instances, qualitative statements to discern “smaller” from “larger” companies as well as “fast” from “slow” growth are sufficient to support the arguments.

In the description of growth patterns, it seems useful to think in “stages” or “phases” with common characteristics in terms of size, organizational form, management focus and challenges. A wide variety of stage models have been proposed (e.g. (Greiner, 1972; Galbraith, 1982a; Kazanjian, 1989), and the number of stages may vary from three to ten

(Hanks et al., 1994), and many of them are descriptive in the sense that they are not based on rigorous empirical evidence but rather conceptual interpretations of patterns based on observations of the author(s). Hanks, Watson, Jansen and Chandler have compared 10 different stage models and report on common patterns (Hanks et al., 1994). five stages have been identified: Start-up, Expansion, Consolidation, Diversification and Decline. They observe some common patterns across the models that are summarized in Table 1.

The decline phase, included in some models, may be a part of the life-cycle of a company, but offers much less opportunity for generalization than the other stages. On the one hand side, decline might actually happen at any stage of the company, small or large, and for various reasons, both internal and external. On the other hand side, the management challenges associated with a decline scenario are certainly very different from the ones associated with growth, and will be less predictable. However, obviously the organization has reached certain limits and faces challenges that cannot be overcome with the management methods and strategies at hand. Here, innovation might be the right tool to return to a path of success.

It appears that the early phases of a venture follow a more predictable pattern than the development of large companies. The reason for this may be found in the analogy of the surface-to-volume ratio which is also employed by Coad (Coad, 2009) to explain corporate inertia. If the firm is compared to a volume body, say, a sphere, the surface can stand for the interaction with the outside environment, while the volume can be interpreted as the internal structure of the company. If a single entrepreneur starts a venture, the internal structure consists of one person, which is strongly shaped by and dependent on the external influences and inputs. The procedure of entrepreneurial venture founding is strongly dictated by the need to raise capital, and the mechanisms of the venture capital market may force a certain sequence of events on the founder. Large companies, however, have a lot of internal structure, specialized functional departments that are mainly concerned with company-internal matters and have no relevant interaction with the outside. In effect, the ratio changes dramatically with much more volume and much less surface. While this may also be one of the root causes for

corporate inertia, it also offers the opportunity to take deliberate decisions and maneuver the strategy in a way that a small venture could not.

Also, large companies had a long time to develop their organizational forms, which might have led to highly specialized, company-idiosyncratic solutions that are not found elsewhere. Most likely, the development of organizational structures that enables continued success of very large companies is a very complex matter that will prevent it from generalization.

Therefore, the last stage (except decline) that describes the largest companies, may include a wide variety of companies in terms of size, growth rate, and organizational forms, that are difficult to cluster. For example, Greiner in his 1998 update (Greiner, 1998) of his 1972 model (Greiner, 1972) gives an outlook for the development of very large companies. After going through the initial three phases – *Creativity*, *Direction* and *Delegation* – that are well in line with the stages in other models, companies arrive at the *Coordination* stage, where individual departments, that may as well be sub-companies, will strongly interact with each other, coordinated by a strong headquarters. The fifth phase then is labelled *Collaboration*, suggesting a strong focus on behavioral qualities, induced, motivated and kept alive by strong leadership management personnel. The sixth phase, previously unlabeled, could be called *Alliances*, based on the observation that the growth from within may be limited and further opportunities may be realized by creating a network of organizations where the central organization acts more like a bank, attracting capital to feed the growth of the separate entities. (Greiner, 1998)

4.1 The life-cycle model based on the OLC-5 model of Lester, Parnell, and Carraher

As explained above, a variety of stage models for growth is available. This thesis uses a model based on one of the more recent proposals, by Lester, Parnell, and Carraher (Lester et al., 2003), called the “OLC-5 model”, supplemented with features of the popular growth models of Greiner (1972, 1998) and Galbraith (1982a).

The following reasons justify the decision:

- **This model applies to companies of all sizes.** Several other models are focusing on describing only the young/small phases of ventures. However, this model attempts to describe the whole life-cycle, including the decline.
- **This model dates from 2003.** While Greiner's model dates from 1972 (Greiner, 1972) and Galbraith's work from 1982 (Galbraith, 1982a), the OLC-5 model is a more recent contribution.
- **This model synthesizes several previous models.** The authors draw from a thorough examination of the extant literature and make an effort to distill the most meaningful pattern from it. It aligns well with the well-known growth model of Greiner (1972), as well as the "Stages of Growth" of Galbraith (1982a). This is important because both those authors have strongly influenced the research of life-cycle stages and provide intuitively accessible descriptions that help the understanding of the management challenges. The OLC-5 model features five phases, which is a rather common number among the life-cycle theories. It provides enough granularity to study the phases in sufficient detail but does not provide for too many phases that might be poorly separated from each other.
- **This model includes a decline stage.** A critical comment to some growth models is that the assumption of steady, positive growth is overly simplistic and rarely encountered. Several scholars therefore included decline stages into the models. While the decline may be much less characteristic than the progression of growth phases, it is still relevant to consider such conditions and implications of negative growth.
- **This model is empirically supported.** The scale was administered to 242 practicing managers at a training program in the Southeastern United States, and the responses supported the existence of five dimensions in the OLC construct. While this is based on manager's perception rather than more tangible parameters, it provides a meaningful foundation for the discussion of managerial problems.
- **This model provides some link to strategic choices.** While the authors acknowledge that the link is rather weak and limited by the scope of the study, there is some indication that companies in different phases prefer certain

strategies. For example, young “Existence” companies rather choose – not surprisingly – the “Prospector” or “First Mover” strategy, while in the Success phase “Defender” or “Segment Control” are preferred. Other phases are not that accentuated, but it appears that the “Low cost” strategy is only employed in later stages.

Table 1 shows the defined stages, their relation to phases of other prominent models, as well as the common characteristics. The models of Greiner (1998) and Galbraith (1982a) are used to supplement the scenario descriptions as they provide different viewpoints that can help to analyze the specific challenges.

The following sections define the stages in more detail.

STAGE ONE: EXISTENCE

The first stage from founding event or “birth” of the company is characterized by the entrepreneur (or the small core team) trying to sharpen the business opportunity, tune the business model, identify first customers and acquire the necessary funding. If successful, the cash flow will eventually turn positive to reach break-even.

STAGE TWO: SURVIVAL

The second stage is characterized by strong growth, due to the rapid expansion of sales. It is the stage of production ramp-up and efficiency improvement. Additional plants or offices may be added to support the growing reach. These tasks require different capabilities than were necessary in the first stage. Therefore, a change in management is often required.

STAGE THREE: SUCCESS

The third stage is often referred to as maturity. It describes well established, rather large companies that have stood the test of time. They are predominantly formal, departmentalized and bureaucratic. Growth is still achieved, but much less accentuated than in stage two.

STAGE FOUR: RENEWAL

This stage summarizes all possibilities of companies to rejuvenate and enter into a new phase of strong growth. It provides for all sorts of diversification strategies and includes companies of all sizes, with no upper boundary.

STAGE FIVE: DECLINE

While a phase of negative growth, or even demise into death can potentially happen at any stage, it is naturally presented at the end of the life-cycle.

Table 1: Phase relation and common characteristics of selected life-cycle models (adopted from Hanks et al., 1994)

OLC-5 model (Lester et al., 2003)	1. Existence	2. Survival	3. Success	4. Renewal	5. Decline
Greiner (Greiner, 1998)	1. Creativity	2. Direction	3. Delegation	4. Coordination 5. Collaboration	Not considered
Galbraith (Galbraith, 1982a)	1. Proof-of-Principle/Prototype 2. Model Shop	3. Volume Production Start-up	4. Natural Growth	5. Strategic Maneuvering	
Hanks (Hanks et al., 1994)	Start-up Stage	Expansion Stage	Consolidation Stage	Diversification Stage	Decline Stage
Age	Young	→	→	Older	Any Age
Size	Small	→	Large	Largest	Declining
Employees	<100	<1000	<10000	>10000	Declining
Growth Rate	Inconsistent	Rapid Positive	Slow Growth	Rapid Positive	Declining
Structural Form	Undifferentiated, Simple	Departmentalized, Functional	Departmentalized, Functional	Divisional	Mostly Functional
Formalization	Very informal, personal, flexible, few policies	Formal systems begin to emerge, but enforcement is lax	Formal, bureaucratic; planning & control systems are enforced	Formal, bureaucratic	Excessive bureaucratization
Centralization	Highly centralized in founder	Centralized, limited delegation	Moderately centralized	Decentralized	Moderately centralized
Business tasks	Identify niche; Obtain resources; Build prototype; Set up task structure	Volume production & distribution; Capacity expansion; Set up operating system	Make business profitable; Expense control; Establish management system	Diversification; Expansion of product market scope	Revitalization; Redefinition of mission and strategy

4.2 The innovation value chain

For the analysis of the implications of the life-cycle stages to innovation management, the “innovation value chain” proposed by Hansen and Birkinshaw (2007) is used, see Figure 7. This model breaks down the innovation process into “unit operations”, connected to form a value chain. An effective innovation management system has to support each of the functions sufficiently, as the performance of the whole chain will be limited by the weakest link. For example, company A might have an abundance of ideas, but a poor selection process and might end up in a mess, where nothing gets accomplished; Company B may have resources and processes in place but the ideas are not coming. Each function requires organizational support. For this thesis, the steps of the innovation value chain are applied to the life-cycle stages in order to derive the innovation related challenges for each stage.

	IDEA GENERATION			CONVERSION		DIFFUSION
	IN-HOUSE Creation within a unit	CROSS-POLLINATION Collaboration across units	EXTERNAL Collaboration with parties outside the firm	SELECTION Screening and initial funding	DEVELOPMENT Movement from idea to first result	SPREAD Dissemination across the organization
KEY QUESTIONS	Do people in our unit create good ideas on their own?	Do we create good ideas by working across the company?	Do we source enough good ideas from outside the firm?	Are we good at screening and funding new ideas?	Are we good at turning ideas into viable products, businesses, and best practices?	Are we good at diffusing developed ideas across the company?
KEY PERFORMANCE INDICATORS	Number of high-quality ideas generated within a unit.	Number of high-quality ideas generated across units.	Number of high-quality ideas generated from outside the firm.	Percentage of all ideas generated that end up being selected and funded.	Percentage of funded ideas that lead to revenues; number of months to first sale.	Percentage of penetration in desired markets, channels, customer groups; number of months to full diffusion.

Figure 7: The innovation value chain (Hansen and Birkinshaw, 2007)

The following methodology is used:

- First, the characteristics of each phase are described with a focus on the challenges for innovation.
- Second, each of the sequential steps of the innovation value chain are analyzed and specific challenges are identified.
- Third, recommendations for the characteristics of a suitable innovation management system are derived.

The characteristics of each stage are interpreted for their influence to the innovation management system, focusing on the challenges of each stage on a general level. Then, the individual building blocks of the innovation value chain are studied how they might be affected by the life-cycle situation, which answers research question 1 (see below points 1-4).

Based on the findings, in an attempt to answer research question 2, recommendations for the design of the IMS for each phase are derived, based on theoretic reasoning supported by findings of the literature (see below point 5).

For each stage, the chapters are structured as follows:

- 1 The **characteristics** of each stage are shortly revisited and the **challenges** of the stage are interpreted from the point of view of innovation management. Then the innovation value chain main chapters are used to elaborate on effective management methods:
- 2 **Idea generation**: Explains how the characteristics of the specific phase influence the **in-house** and **external idea generation**, as well as the **cross-pollination**.
- 3 **Conversion**: Explains how the characteristics of the specific phase influence the **selection** of innovation projects as well as the following through on the **development** of them.
- 4 **Diffusion**: Explain how the characteristics of the specific phase influence the **spread** of new ideas and innovations.
- 5 **Recommendations**: Based on the challenges of the life-cycle stage to the innovation process, recommendations are derived to tackle each challenge.

Where appropriate, reference to examples mentioned in the literature are given.

4.3 Restrictions and critique to stage models

Stage models are an attempt to make the complex phenomenon of company growth easier to digest, and they use rhetoric to describe scenarios that have intuitive appeal, in order to conceptualize certain issues in organizational development, their implications and possible resolutions.

Despite their popularity, stage models of growth have been heavily criticized as well (see e.g. Phelps et al., 2007; Levie and Lichtenstein, 2010). While since the 1960's, more than 100 different models have been proposed, there was little agreement even on basic parameters like the number of stages or what constitutes a stage. Attempts to empirically justify the models lead to sometimes contradictory results, showing the boundaries of those models. (Levie and Lichtenstein, 2010). It may be argued that there are no distinct stages but rather continuous changes, or that the stages cannot be generalized but rather different companies develop individually. Also the sequence of stages might be not as stringent as the models suggest.

Levie and Lichtenstein even present „A terminal assessment of stages theory” and *“urge [...] to abandon efforts to either predict or test a specific set of stages that are meant to describe the growth of business firms”* (Levie and Lichtenstein, 2010).

As mentioned above, Phelps, Adams and Bessant (2007) also discard the notion of growth stages and suggest six major categories where, at some critical level, ‘tipping points’ may be reached that form *“a basic set of key issues that all growing firms can expect to encounter at some point.”* They suggest to build absorptive capacity to overcome those issues.

Despite the mentioned limitations, this thesis uses a life-cycle stage model because it provides conceivable scenarios that can be analyzed. Even though individual companies might not fit to this pattern, managers might identify certain features of a scenario that applies to their situation, and may find indications for improving internal structures and procedures.

The description of the stages is intentionally exaggerated, in order to draw a convincing picture of the situation and make issues more apparent. Elements of phase or stage descriptions from various authors are used, specifically from the works of Galbraith (1982a) and Greiner (1972, 1998), in order to provide a set of different viewpoints.

A specific individual company may not follow this sequence, omit a stage or evolve completely different. The attempt is not to draw a narrow development trajectory that predicts the future, but rather to distill common challenges and pitfalls that may be encountered and how to overcome them.

5 Results: The innovation value chain in each life-cycle stage

In this chapter, possible answers to both research questions (see chapter 2.2) are being elaborated.

As explained in the previous chapter, the innovation value chain model is applied to each of the growth phases of the OLC-5 model. In addition to just focusing on the duality small/large or start-up/incumbent, this adds a layer of detail that is required to study how companies in various stages can adapt their innovation management systems to best suit the needs.

For the basic elements of an innovation management system (IMS), a wide array of text books is available (e.g. Hauschildt and Salomo, 2011; Trott, 2012; etc.). However, there is no “one size fits all” system and such an IMS should be tailored to the specific needs of the company. If done properly, such a tailored process can become a competitive advantage (see e.g. Kleinschmidt et al., 2007). Such tailoring includes taking into account the industry and market know-how and the internal organizational structure and decision-making procedures. Having this in mind, the recommendations are meant as specific features to counter the challenges derived from the analysis on a general basis. Those recommendations are derived from three sources: (1) text books on innovation management, (2) research papers and (3) the author’s industry experience. The implementation of the recommendations has to be embedded in the company’s management system taking into account its idiosyncrasies.

5.1 Stage one: Existence

5.1.1 Characteristics and challenges

This stage described the very early days starting with the inception of the company, where the main focus is on identifying and assessing the market opportunity, developing the business model, finding customers, securing the funds, and assembling the team. In this phase nearly everything hinges on the founder (or founder’s team), and there is no real structure in the company yet. Greiner calls it the *Creativity* phase, and it spans the two Galbraith stages *Proof-of-Principle/Prototype* and *Model Shop*.

Considering the characteristic curve of cash flow development for start-up companies, shown in Figure 8, the *Existence* stage describes the phase with generally negative operational cash flow, from inauguration until break-even.

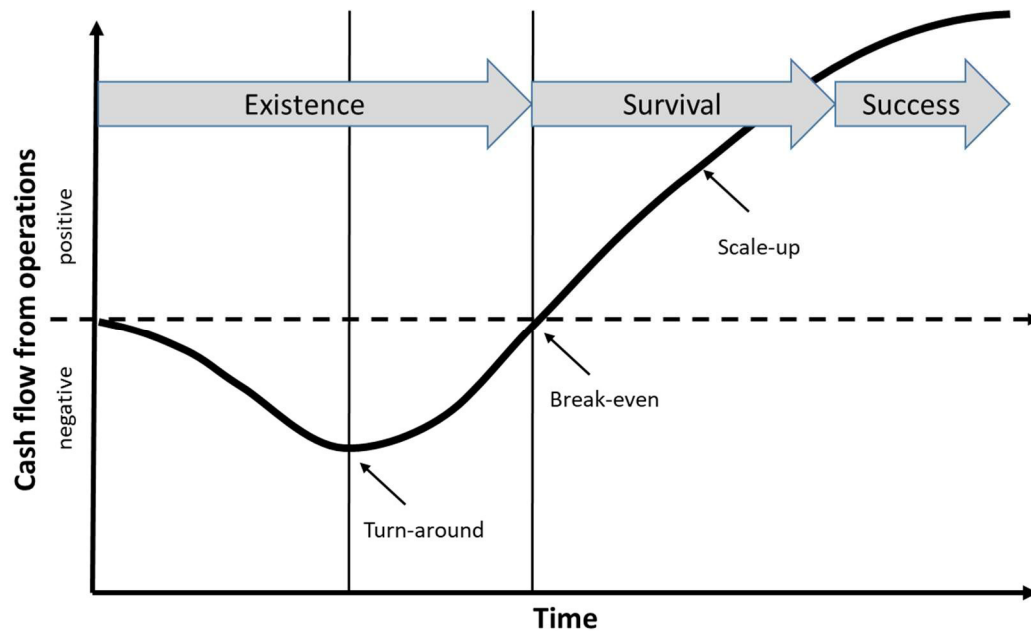


Figure 8: The characteristic shape of the cash-flow curve of start-ups and its relation to the growth phases (Own illustration)

As You pointed out (You, 1995), small firms seem to play an especially important role in highly innovative and skill-intensive industries which are in early stages of their life-cycles (Coad, 2009), underscoring the high importance of innovation for small companies. In the emerging phase of a company the culture usually entails a complete customer focus, creating new products and markets. The small companies benefit from efficient information flow, relatively quick decision-making and proximity to their customer base (You, 1995). Communication is frequent and informal, ideas get bounced around and quickly implemented, and sometimes dropped rather quickly as well if they don't work out. In this phase, the entrepreneurial spirit of the founders inspires the team. There is no lack of ideas, just a lack of money and time. The main challenge is to quickly select the most appropriate ideas to implement right away, and to record any ideas that cannot be followed up right now or that cannot be implemented yet for lack of resources or other issues, for later use. In this period, business plans are developed and the search for capital occupies a substantial portion of the founders' time (Freeman

and Engel, 2007), often distracting him or her from managerial tasks. The characteristic development of cash-flow for a start-up is shown in Figure 8. In its beginning, the initial product (or service) development will burn cash, and the company draws from the initial fund injection by the founders, seed capital or government grants. Prototyping, market testing and early customer interaction are the main activities. All of these require a lot of creativity, agility and nimbleness, and formalities play a secondary role. When the first paying customers are found, the cash-flow will eventually turn positive (“turn-around”), which is usually a crucial point of big relief in the history of a young start-up. It is also the point where quality aspects gain more importance. Paying customers have certain expectations, both voiced and unvoiced ones, and they have to be met or managed. For example, flaws that had been acceptable in the prototyping phase for early testing, have to be fixed for the final products. These activities require some more scrutiny and possibly different skills than before. Quality assurance and customer service have to be established. In the ideal case that all start-ups intend to pursue, the turn-around in cash-flow should lead into a steady growth phase with the break-even as the next big milestone. This is usually the time when another round of cash injection is needed, and the founders will be looking to obtain capital. Division of labor kicks in, and while the initial development team will continue to develop new functions and fix upcoming issues, other people will take charge of manufacturing operations, in order to stabilize production for larger volumes, fix quality issues and reduce manufacturing cost. At this point, the organic company structure might come to its limits, and first attempts to internal organizations take place. The entrepreneurial founders may find it difficult to switch their mindset to the different requirements of the upcoming growth phase, often leading to a required change in the leading management team, a revolution that Greiner termed the *Crisis of Leadership* (Greiner, 1972).

5.1.2 Idea generation

Start-ups are usually founded by entrepreneurial individuals that exhibit strong traits of creativity, which inspires the rest of the team. This stage revolves around the business idea(s) of those entrepreneurs. Inputs may come from all kinds of sources, the founder’s past experience, collaboration partners, friends and family, funding institutions like banks, angel investors or venture capitalists, providing for strong **external** ideation. In

addition, the young team is probably comprised of individuals that have different backgrounds and most likely also still entertain active links to the outside, the universities, previous employers or other partners, that may serve as valuable inputs. Interaction with early customers will provide critical feedback and initiate new ideas.

The in-house idea generation is provided by a team that is usually comprised of highly motivated, creative people that bolster from ideas, therefore the **in-house** idea generation should not be a problem.

And as the team is still small enough, and most likely co-located, so that everyone talks to everyone, **cross-pollination** is the rule and not the exception. Frequent informal conversations and discussions take place as the endeavor of building a venture usually makes up a major part in the lives of the team members.

As a summary, in start-up company there is usually no lack of ideas. The main challenge is to **record the ideas in an appropriate way**, so that abandoned ideas that might be valuable later on, are not lost.

5.1.3 Conversion

The **selection** of business opportunities is highly concentrated in the entrepreneur or the small core team and feeds into the modeling of the business models. As such, the task is highly complex because it involves consideration of many unknown facts, but there is not much that the organizational form can help. The selection of technical ideas will primarily be driven by the need to solve immediate problems, and whatever works and can be done with the limited resources will be implemented. These **decisions are often done individually and informal**. Rapid and direct customer feedback prevents that the wrong ideas will proliferate for very long. However, there might be a bias towards quick win solutions that could cause issues later. Therefore, thought should be given to **risk of negative long-term implications** of the ideas.

The **development** concerns the creation of early prototypes to demonstrate the technical proof-of-principle and the key features of the intended product. Anything that contributes to it will be pursued, and in such ideas the energy will be devoted. Any other ideas that are not directly contributing to it – or not quickly enough – might be viewed as distractions and are not pursued. Another restriction is the **scarcity of resources**. In a

start-up, money is usually an issue and any funds available have to be used for the immediate product (or service) at hand, in order to bring it to the customers as fast as possible. Heavy investments into new equipment may not be possible, potentially prohibiting the implementation of some ideas that would call for it.

5.1.4 Diffusion

Due to the smallness of team that is usually co-located, and frequent interaction, the **spread** of innovations is instantaneous and other members are expected to be eager to take over and build on them.

Even in the case of dispersed working locations, as might be the case for e.g. software development, the communication between the members is very intensive, and all the team works on just one product. Therefore the diffusion of ideas is considered to be no problem.

5.1.5 Recommendations

The challenges and recommendations for the *Existence stage* are summarized in Table 2. The recommendations are described in the following sections.

Idea repository: All the ideas that are developed may be valuable assets, and their value may become more apparent in later stages of the company, they may be a source for improvement and diversification. As pointed out, in the early phases many ideas might be abandoned quickly because they are not in the main focus. However, it is recommended to store them in an appropriate idea repository. This shall make sure that all ideas that are currently not pursued are recorded and shelved for later use. This is also a mitigation to the risk that an employee might leave the company and take a long a lot of the ideas. In this repository, ideas may be described in any available form, but the following questions should be answered: “What problem does the idea solve?”; “What would be needed for the implementation?”; “Why is it not pursued right now?”

Table 2: Challenges and recommendations for the Existence stage

Stage One: Existence			
		Challenges	Recommendations
Idea generation	In-house	Recording ideas that are not pursued	Idea repository
	Cross pollination	--	--
	External	Recording ideas that are not pursued	Idea repository
Conversion	Selection	Individual, informal decisions Risk of negative long-term implications	Meeting moderation techniques Market Opportunity Navigator Training of employees on decision making and risk analysis
	Development	Scarcity of resources	Focus
Diffusion	Spread	--	--

Meeting moderation techniques: The inception of a new venture entails strong interactions with a lot of internal and external stakeholders. The communication skills of the founder will play an important role, and meeting moderation techniques may help in reaching agreements.

In the early stages of a start-up, pivoting is often required, meaning that different markets or segments may have to be addressed or changes to the business model are required. In terms of business model and market opportunity ideas, the “**Market Opportunity Navigator**” (Gruber and Tal, 2017) may serve as appropriate tool, because it encourages to capture also alternative routes that are not pursued right now, into the categories “keep open” and “place in storage”:

- **Keep open:** spend little resources, but make sure it remains a viable option and is not prohibited by any decision being done.
- **Place in storage:** Do not spend resources on it now, but keep the record in order to revisit it when needed.

Risk assessment: In the Existence phase, many decisions may be taken by individuals and without much formal decision making or approval. While this provides for empowerment and support a positive working atmosphere, it bears the risk of “short sighted” decisions. The decision to implement an idea, e.g. for the solution of an immediate problem at hand, may be driven by the need to fix the problem quickly and as cheaply as possible. Such “quick fix” solutions may have implications for later. On the one hand side, it may not solve the problem sustainably but only on the surface, causing issues when the production should be scaled up. Another risk is that such a decision might not be the most effective solution on the long run. Even worse, the early decision might block the change to a better design variant at a later stage due to the implications. Such risks shall be considered in a risk assessment in the decision making process. As for start-ups it does not seem appropriate to implement an approval procedure, employees should be trained to perform the risk analysis by themselves and seek advice in case they cannot conclude. The result of such risk assessments shall be recorded.

Focus: As funds and scarce and time is pressing, only ideas should be pursued that contribute to the immediate product (or service) at hand. Playful experimentation should not be restrained by it, but the devotion of major time and monetary resources should be avoided. Such ideas might be shelved for later when the critical phase has been survived.

5.2 Stage two: Survival

5.2.1 Characteristics and challenges

When a start-up has successfully managed to survive the first critical phase, achieved the turn-around and break-even, the next logical step is growth by sales expansion and production ramp-up. This includes the production of large quantities of the product, or scaling the service for more clients, generally enlarging the customer base for the one

product or service at hand. The following challenges may be faced: need for capacity extension, excessive production cost, production instabilities, high failure rate (market returns, warranty), need for customer service (after-sales service), administration, contractual milestones for investors or grants may have to be achieved and reported, distribution issues, possibly the onset of competitor moves. Those challenges are very different from the inauguration phase of the start-up. Their resolution requires discipline which might get in conflict with the creative climate of the early days. The management tasks required may not be the core competence of the entrepreneurial founder (team), leading to Greiner's *Crisis of Leadership*. Usually, a new person with the required skill set and experience is brought in as manager, sometimes forced by the investors. Of course, also a founding member or internal employee might take over this role, but the management style has to change in order to resolve the crisis. The management is introduced to direct the growth, especially in operations, seeking excellence, and it is important not to alienate the creative employees of the first phase, that might be disenchanted by the introduced procedures.

When the growth continues, the initially targeted market for the first product may become saturated and the need for expansion and/or diversification will arise.

- Expansion means offering the same product(s) or service(s) to new customers, e.g. in other geographical locations. This may entail opening branch offices or additional manufacturing sites (plants).
- Diversification may start with iterative product diversification, adding variations of the first product or service to the portfolio, e.g. by offering premium and low-budget versions, or some degree of customization. This is also expanding the customer base by addressing different customer segments, e.g. high-end and low-end users.
- Further diversification may entail the offering of new products, asking for the "new product development" process (NPD) to take shape.
- In this stage, most companies remain in the initial industry and the same general market. More radical diversification into other industries or markets is expected to happen more frequently in later stages.

Greiner assumes that the company gets geographically or at least organizationally dispersed, with distinct departments or subsidiaries that have real or felt distance from the central management, and finally feel disparate from the headquarters, eventually leading to the *Crisis of Autonomy*.

5.2.2 Idea generation

In-house idea generation might plateau because employees are **drawn towards exploitation** by professionalization of production and services. On the short run, the growth of a successful product may take the attention and resources away from any new product development. **Employees with creative mindset may feel disengaged** and leave the company. Knowledge and creative potential may be lost.

External idea generation might as well be hit, as the company begins to be self-sustaining and might cut some collaborations that don't seem to be necessary any more. On the other hand, a growing supplier base might bring in new ideas, especially as the growing purchasing volume of the firm makes it more interesting for suppliers to appeal with innovative offerings on their behalf, cooperation may be possible. New customer groups, maybe from other regions, may ask for different functionality, inducing new ideas on their behalf, captured and communicated by a growing number of sales representatives. As the growth continues, the competition will get stronger and reaction may be necessary, also serving as an external influx of ideas.

Cross-pollination might be hampered because the growing number of employees calls for a split into dedicated teams, and offices may be separated. Without specific measures against it, **communication between the teams might flounder**. This becomes even more accentuated when new locations are being opened, either as sales offices, production plants or departments, that are geographically set apart.

5.2.3 Conversion

The **selection** of innovation projects is most likely centralized, and the directive management might emphasize on quick growth by **focusing on exploitation** of successfully introduced products and services and their continuous improvement by incremental innovation and small diversification. Foresight will be needed to leave room for exploration. On the other hand, longer term strategies might be implemented and

ideas that wouldn't be realized quick enough for the start-up phase might have a chance to get resources allocated and secured.

Companies in this phase usually have a strong track record in following through on the **development** of approved projects, as the resource allocation is centrally coordinated and controlled.

5.2.4 Diffusion

The **spread** of new ideas or developments does not happen automatically any more, as it did in the *Existence* stage. Without specific measures, teams might disconnect and might not be aware of other team's ideas and innovation projects because of a **lack of communication**. The central management will act to avoid parallel developments, but it may lag behind and efficiency might be lost.

5.2.5 Recommendations

Maintain innovative company culture. For example, Salomo (2005) points out that an innovation-friendly company culture and sufficient top-level management commitment are the most important requirements for a successful new product development program. (Salomo et al., 2005) An innovative company culture can be described and assessed e.g. using the framework of Rao and Weintraub (Rao and Weintraub, 2013), see section 3.3.

Managers should be aware that the splitting the staff into teams requires new mechanisms to **ensure communication between the teams**. Joint meetings on a regular basis and pro-active communication of new development projects might help from the formal point of view. In terms of culture, shared break rooms like coffee kitchens might provide the opportunities for informal communication. For geographically separated locations, it is recommended that key personnel (both from technical R&D as well as production, sales and marketing) travel back and forth to facilitate the mutual understanding and communication.

Design a "new product development" process (**NPD process**) to govern innovation project decisions. This might include the installation of a stage gate system. For example, Cooper (2017) describes an Agile - Stage-Gate- hybrid model, that is scalable to different risk levels of a project.

Table 3 gives an overview of the identified challenges and possible counter measures. The recommendations are described in the following sections.

Maintain innovative company culture. For example, Salomo (2005) points out that an innovation-friendly company culture and sufficient top-level management commitment are the most important requirements for a successful new product development program. (Salomo et al., 2005) An innovative company culture can be described and assessed e.g. using the framework of Rao and Weintraub (Rao and Weintraub, 2013), see section 3.3.

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Design a “new product development” process (**NPD process**) to govern innovation project decisions. This might include the installation of a stage gate system. For example, Cooper (2017) describes an Agile - Stage-Gate- hybrid model, that is scalable to different risk levels of a project.

Table 3: Challenges and recommendations for the Survival Stage

Stage two: Survival			
		Challenges	Recommendations
Idea generation	In-house	Disengagement of creative staff Focus on exploitation	Maintain innovative company culture
	Cross pollination	Lack of communication between disparate teams / sites / locations	Ensure communication between the teams Maintain innovative company culture
	External	--	Maintain innovative company

			culture
Conversion	Selection	Focus on exploitation	Design NPD process Foresight and innovation strategy Prepare to cannibalize your own products or services.
	Development	--	--
Diffusion	Spread	Lack of communication	Employ all modern modes of communication

Develop **foresight and innovation strategies**: Consider the three horizons as put forward by Baghai, Coley and White (Baghai, 1999) that are shown in Figure 9: the first horizon is the immediate core business, which should be extended and defended. On the second horizon, emerging businesses should be built. This means exploring into new markets and building on new technologies. Business plans can be worked out and investments can be triggered. The third horizon is less concrete but should always be considered. Future opportunities should be uncovered and observed, and in some cases strategic bets may be placed on selected options. (Baghai, 1999)

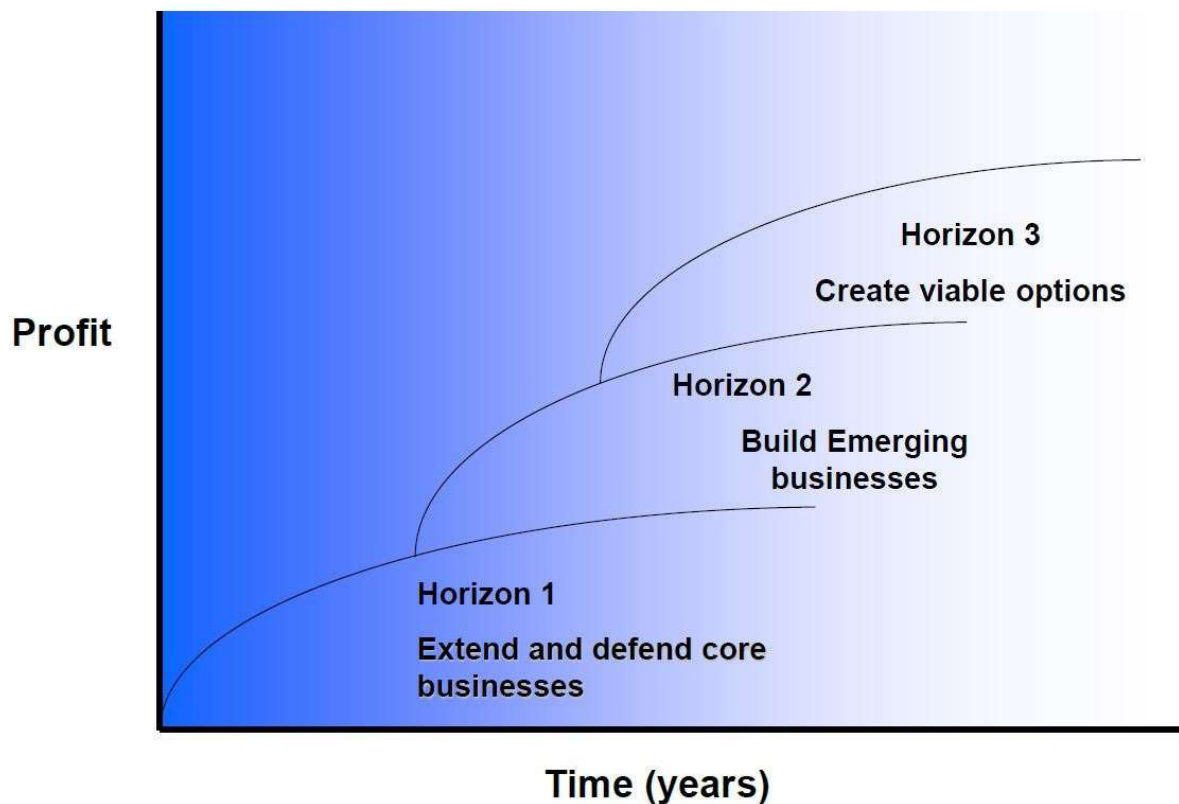


Figure 9: Three horizons of growth (Baghai, 1999)

Prepare to cannibalize your own products or services. Keep in mind the importance, opportunity and risk of radical innovations (that might lead to disruption). Chandy and Tellis have shown that the willingness to self-cannibalize sets apart the incumbent companies that commercialize and benefit from radical innovations from others (Chandy and Tellis, 1998). This message was put into remarkable words by former Microsoft COO Bob Herbold by saying “*Disrupt your business before someone else does!*” (Bagley, 2014)

Employ all modern modes of communication. In order to support the spread of ideas as well as the desired company culture, all modes of modern communication should be used. A company-wide intranet page may be considered minimum standard, it may be supplemented by an interactive platform, like a wiki or chat room functionality. A company-wide video communication including desk-top sharing shall also support the seamless communication between sites. On-line collaboration tools with shared storage should facilitate the cooperation. Newsletters might be used to disseminate new ideas, encourage communication and cooperation, and underpin the company’s values.

5.3 Stage three: Success

5.3.1 Characteristics and challenges

After a phase of growth by expansion and simple diversification, the company might find its limits in the initially addressed market. The growth slows down, but the firm is organized, settled, stable. The name *Success* of the stage is misleading, as it carries a very positive message. However, the description indicates that success *was* achieved, but the zenith of growth has already passed. Other names for such a stage include *maturity* stage, Galbraith calls it *Natural Growth*, and it most likely suits Greiner's *Delegation* phase, where headquarter shifts responsibility to the outside departments or regions in an attempt to manage the complexity. The functions are settled, processes are defined and running smoothly, operations are effective, controls are installed. Things are becoming rather rigid, stiff, changes are more difficult to introduce, formalities precede, "red tape" is all around. Growth may still occur, as people have learned to read the market, and how to sell the product(s) nicely. However, building on past success may restrain people from trying something new and risky. It is the time when core capabilities have become the core rigidities. The management yet has to learn to deal with diversity.

According to Greiner, the company has outgrown the central direction. Besides a (still) strong headquarter, local branch offices or plants were established in various locations and regions and have learnt to operate independently from the headquarter. They are collecting customer's feedback and are reacting to it, e.g. by specific marketing, distribution channels and customer service. While during the *Survival* stage, the product (service) variety was still commanded centrally, this authority is now delegated (at least in part) to the local departments or regional headquarters. They might install their own R&D facilities and have an own new product development process, that is adjusted to the local idiosyncrasies and specific technical capabilities. This empowers them to react to varying market needs in shorter cycles.

In this phase, additional companies may be acquired to support the growth. The reasons may be regional expansion, addition of specific technical expertise or an increase in market share, e.g. by taking over a competitor. Those companies have their own history and developed core capabilities, management systems and corporate cultures. It is a big

challenge to integrate those into the mother corporation, but there are big opportunities: Often companies are acquired because they have incubated a new technology or another radical innovation, which should now be commercialized by the mother company, making use of the complementary assets (Teece, 1986), e.g. market intelligence, market access, customer base, distribution channels, marketing expertise. Also, these small companies may be in earlier growth phases and have a more innovation-friendly corporate culture. The headquarter may try to maintain the relative independence of those companies and only integrate as much as necessary. This may be seen as a concept of ambidexterity (O'Reilly and Tushman, 2004).

5.3.2 Idea Generation

Companies of this size usually have established R&D departments and **expect in-house ideas to originate there**. While there might be formal systems to collect ideas from everywhere in the company, e.g. through continuous improvement programs like *Kaizen*, radical innovations should not be expected nor would they be embraced. The firm might be too much constrained by the history, people might think that “they know what works and what doesn’t”. Ideation lacks the spark because of the **disengagement of creative staff**.

External ideas are brought in mainly by marketing studies, analyzing the customer base, “**market pull**” **prevails**. The acquisition of innovative companies might give the external ideation a push, but it challenges the absorptive capacity of the established corporate structure.

Cross-pollination works mainly within the R&D department but is difficult to maintain between the spread-out local departments that have no incentives to collaborate, resulting in a **lack of communication**.

5.3.3 Conversion

The **selection** process for innovative ideas is most difficult in this stage. One reason is the formality and hierarchy that has been established. In order to get approval, ideas have to be worked up the ladder and might get distorted, abandoned, or simply rejected along the way. Another reason lies in the specialized functions, like R&D, manufacturing, marketing and sales. Each of them might have their own stance of how improvement

should look like or what has a chance of flying and what doesn't. The company **might not yet have developed suitable decision-making processes** to synthesize the various viewpoints.

The **development** of innovation projects may be affected by the poor selection process as well. Even though a project might eventually obtain approval and budget, implementation is far from secure. Half-hearted decisions may be difficult to enforce, priorities might be set differently by the ones assigned to work on it and innovations may simply "fade away", because of a **lack of commitment to new ideas**. The risk is higher the more radical the innovation is, the more change it requires from the organization, and the more remote the idea was coming in.

5.3.4 Diffusion

With offices being physically separated in different locations, **inter-department communication might be reduced to a minimum**, making the **spread** of innovations a specific challenge. When the departments are set up as profit centers, there might not even be an incentive to have others participate in the innovations developed. Even if innovations are communicated, the reception in remote departments might be limited. With the formalities established, diffusing innovations is a capability that is yet to be developed.

5.3.5 Recommendations

The challenges and recommendations for the Success stage are summarized in Table 4 and recommendations are described below.

Maintain innovative company culture: See section 5.2.5.

Table 4: Challenges and recommendations for the Success stage

Stage three: Success			
		Challenges	Recommendations
Idea generation	In-house	Disengagement of creative staff Reliance on ideas from the R&D department	Maintain innovative company culture Incentives for company-wide ideas
	Cross pollination	Lack of communication between disparate teams / sites / locations	Ensure communication between the teams Maintain innovative company culture
	External	Prevalence of “market pull”	Maintain innovative company culture Engage in open innovation activities Improve absorptive capacity
Conversion	Selection	Poor decision making process	Foresight and innovation strategy Cannibalize your own products or services. Design system of inter-related NPD processes
	Development	Poor decision making process Lack of commitment to new ideas	Foresight and innovation strategy Ambidexterity Design system of inter-related NPD processes Project management Install innovation champions and sponsors
Diffusion	Spread	Lack of communication	Employ all modern modes of communication Install innovation champions and sponsors

Incentives for company-wide ideas: In addition to a rather innovative company culture, that encourages risk-taking and entrepreneurial thinking, ideas from outside R&D should be encouraged, incentivized, and collected routinely. This may include an (online) ideation platform where ideas can be posted, along with rewards when a posted idea is implemented; or ideation contests where the best selected ideas are rewarded.

Engage in open innovation activities: *"No matter who you are, most of the smartest people work for someone else"* is known as Joy's Law in the high-tech industry (Lakhani and Panetta, 2007). It refers to the fact that a company can only employ a limited number of employees, and they may have high skills and knowledge, but there are likely many others of same or exceeding level that cannot be directly employed by the company. Therefore, many companies pursue open innovation strategies, engaging in various forms of knowledge exchange with external persons or organizations. Henry Chesbrough introduced the term "open innovation" in his 2003 book, and defines it as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation" (Chesbrough, 2003).

Improve absorptive capacity: Cohen and Levinthal *"the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities."* (Cohen and Levinthal, 1990). This capacity is mainly a function of developed knowledge and capabilities of the company's employees. Thus, for a knowledge domain closely related to the current activities of a firm, absorptive capacity may be developed as a byproduct of routine activity. However, for unrelated knowledge domains which may be the source of radical innovations, specific investment must be done, mainly in the form of training and learning. Daghfous (2004) describes the process: *"Acquiring absorptive capacity consists of building (1) the firm's ability to access external knowledge, which requires a knowledge-sharing culture, and (2) the firm's ability to transform and implement external knowledge within the company to enhance its core competencies."* Four chronologically sequential steps represent complementary dimensions of absorptive capacity: acquisition, assimilation, transformation, and exploitation. (Daghfous, 2004) A summary of recommendations to improve absorptive capacity, taken from the Daghfous paper, is listed in the annex.

Foresight and innovation strategy: See section 5.2.5.

Design system of inter-related NPD processes: At this stage the company is decentralized, either by geographic region or by product (group). This may entail the development of individual NPD processes for each sub-unit of the company that best serves the unit's needs. For example, a department serving a market with rapid product iterations may need a fast development cycle, while another part with longer lead times

may take more steps. The NPD processes may also tailored to the risk-level of the projects, with high-risk projects having more steps and holding points, while low-risk projects can transit rather rapidly. These individual NPD process have to be aligned at certain points in order to ensure the appropriate company-wide prioritization and resource allocation. For example, Cooper's Agile - Stage-Gate hybrid may be used (Cooper, 2017).

Install innovation champions and sponsors: Galbraith argues that an innovating company needs *"the combination of idea people, reservations in which they can operate, sponsors to supervise them, funding for their ideas, and rewards for their success that increase the odds in favor of innovation."* Champions are the inventors, the originators of ideas. The sponsors are the ones that support the idea, provide the funds, and protect it against other priorities, maybe coming from daily operations or short-term targets. (Galbraith, 1982b)

Ambidexterity: The balancing act of continued improvement of existing business versus radical innovation is always challenging management. Companies that are able to excel at both are called ambidextrous. This can be achieved in several ways: Contextual ambidexterity is achieved when individuals are provided the opportunity to pursue radical innovations by a certain fraction of their paid working time. Google's famous "20 percent rule" ("give each engineer one day per week to work on blue-sky, big potential ideas of their own choosing") is a permanent setup, in contrast to a project-based setup where individuals are set apart for a certain period of time to devote a share of their time to the innovative project. (Mattes and Ohr, 2013) In the case of structural ambidexterity, organizations *"separate their new, exploratory units from their traditional, exploitative ones, allowing for different processes, structures, and cultures; at the same time, they maintain tight links across units at the senior executive level. In other words, they manage organizational separation through a tightly integrated senior team."* (O'Reilly and Tushman, 2004) The benefit is that the new group may have completely different rules and operating standards, even an own company culture, that may deviate from the existing, "main" business, but better suits the need of radical innovations. This organizational separation is shown in Figure 10.

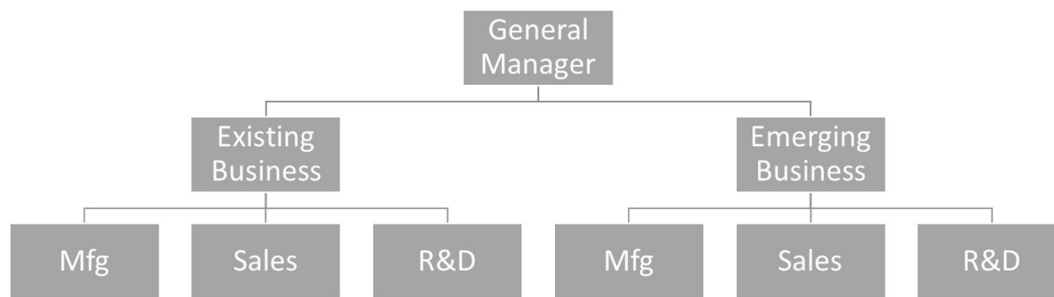


Figure 10: The structurally ambidextrous organization (O'Reilly and Tushman, 2004)

Project management: Good project management starts with the project charter that defines both the (strategic) goals of the undertaking as well as the boundary conditions (PMI, 2017). If the case for the innovation activity has been made, the allocation of resources to this activity can be justified and maintained. Progress tracking and stakeholder engagement can help to avoid a “silent fade-away” of once started innovation projects.

5.4 Stage four: Renewal

5.4.1 Characteristics and challenges

Renewal summarizes all companies that manage to overcome the bureaucratic management style characterized by red tape. This is done by introducing a matrix-structure or calling on task-oriented, cross-functional teams. For Greiner, this would be the *Collaboration* stage where companies introduce a more flexible and behavioral approach of management, formal control systems are being reduced to a necessary minimum and key managers have greater responsibility of leadership, enabling the collaboration by interpersonal contact. Interdisciplinary teams are formed for specific tasks and dissolved as soon as the goal is achieved. Galbraith calls it *Strategic Maneuvering*, giving valuable input how to read this stage. He calls on the choices of diversification versus vertical integration and organic growth versus acquisitions.

This stage may be used to collect all companies that have gone through the first three, rather foreseeable stages, but now escape the generalization. Those companies may be of a wide range of sizes, including very large companies, that have conquered major markets and developed a global footprint. At such a size, continuing to grow requires advanced strategies that do not lend themselves for generalization. It is the arena for

multi-national companies of any size, up to really global footprint. In terms of innovation, it includes the shiny examples of Apple, Google, 3M and many others. One does not get into such ranks by being a copycat; it takes unique capabilities, structures and management procedures to maintain the innovativeness and the success level.

The following sections of problem analysis consider a multi-national, departmentalized corporation with strong headquarter but rather independent business units that are designed to serve regions, product groups or customer segments.

5.4.2 Idea Generation

In-house idea generation can happen anywhere in the company, and a company in *Renewal stage* should have overcome the reliance on R&D departments for ideation, but they might still face the problem of **limited exposure to the outside**: in **highly departmentalized** organizations, employees might be concerned with company-internal processes and procedures and lack outside interaction. Such exposure to the world outside the company, specifically to the customer side, may be crucial to develop new valuable ideas for the firm's products and services.

Without general management incentives, **external** idea generation is strongly **depending on the openness of business unit management** for collaboration with outside bodies like research institutes and collaboration partners and may thus vary greatly within the company. Newly acquired companies may contribute to the external idea generation by bringing in their own customer base, collaboration partners, suppliers and distribution partners.

If there are no mechanisms in place to require the **communication** between business units, **cross-pollination** will be a specific challenge.

5.4.3 Conversion

The **selection** of innovation projects might be de-centralized and in the responsibility of the (local) business units. This gives the opportunity to focus innovations that are specific to the region, customer group, product range or whatever the business unit is specialized in. However, the more independency the business units have, the more difficult it may become to identify the innovations that have most impact for the company as whole, because of several reasons: (1) the business unit may not be aware

of the whole company's needs; (2) there might be a lack of communication of ideas to the HQ, (3) HQ might not fully understand and/or embrace the impact of the innovation, lacking the understanding of the specific "local" needs; (4) business units may have more incentive to implement innovations that are specific to them and may not be incentivized to contribute to the whole company. This may entail the challenge of **alignment of the de-centralized decisions**.

A company of this size has vast resources available and has many options for **development** of innovations, dependent on their size and potential, ranging from regular development project to spin-outs. However, the **resource-allocation** process must be open enough to provide for all these options.

5.4.4 Diffusion

With offices being physically separated in different locations, **communication** between business units might be reduced to a minimum, making the **spread** of innovations a specific challenge. Because of business units may be profit centers with their own profit-loss-statements, there might **not even be an incentive** to have others participate in the innovations developed.

5.4.5 Recommendations

The recommendations for the *Renewal stage* are summarized in Table 5. It turns out that the challenges are very comparable to the Success stage, which are mainly rooted in the geographic dispersion of business units and functions, and a company size that entails many company-internal functions. While the scale might be different, the challenges are of the same nature. The premise is that companies that pass into the Renewal stage have found to overcome the challenges of the Success stage and have found new possibilities of growth. With ever growing size, the individual problems of the innovation process are superseded by the challenge to manage complexity.

Manage complexity: While the complexity challenge exceeds the scope of this work, some hints may be taken from the papers of Galbraith: The Multi-Dimensional and Reconfigurable Organization (Galbraith, 2010) or The Future of Organization Design (Galbraith, 2012).

Table 5: Challenges and recommendations for the Renewal stage

Stage four: Renewal				
		Challenges	Recommendations	
Idea generation	In-house	Departmentalization, limited exposure to outside	Maintain innovative company culture Incentives for company-wide ideas Incentives for external collaboration	Manage complexity
	Cross pollination	No mechanisms and no incentives to cooperate with other business units	Ensure communication between business units Maintain innovative company culture	
	External	Dependent on business unit	Maintain innovative company culture Engage in open innovation activities Improve absorptive capacity Incentives for external collaboration	
Conversion	Selection	Alignment of de-centralized decisions	Clear mission and vision Foresight and innovation strategy Cannibalize your own products or services. Design system of inter-related NPD processes	
	Development	Resource allocation	Foresight and innovation strategy Ambidexterity Spin-out Design system of inter-related NPD processes Project management Install innovation champions and sponsors	
Diffusion	Spread	Many separated locations, separate business units.	Employ all modern modes of communication Install innovation champions and sponsors	

Incentives for company-wide ideas: employees in all functions should be incentivized to contribute to the ideation. This includes possibilities of idea contests or similar, including an attractive and transparent reward system.

Incentives for external collaboration: employees in all functions should be encouraged to external collaboration. Functions that usually interact with customers, like business development, sales or marketing may have sufficient exposure to the outside to also spark internal ideas, however company-internal departments like human resources, controlling or administration may lack this sort of exposure and therefore have limited capability to generate useful ideas. In order to tap this potential, also those functions should be provided with the possibility for external collaboration, e.g. with customers, suppliers or research partners.

Ensure communication between business units: see section 5.3.5. Companies in this phase should make use of all modern communication channels, including intranet pages, possibly even company magazines, newsletters and other types of broadcasting to spread information, also with regards to innovation projects and/or best practices.

Clear mission and vision: The larger the organization becomes, the more important become the mission and vision, as guidelines for strategic decisions.

Ambidexterity: see recommendations for the Success stage in section 5.3.5. Companies in this stage may follow ambidextrous approaches by forming big-company-small company hybrids to vary other structural dimensions of the firm (including formalization, standardization, and centralization) (Schilling, 2016). Research intensive companies that are highly diversified tend to establish separate research and development centers to facilitate communication and transfer of innovation across divisions. Consumer product companies on the other hand, tend to utilize more decentralized R&D, tailoring projects to local markets, and electronics industries tend to centralize R&D in centers of excellence that are devoted to leveraging particular competencies. (Schilling, 2016)

Spin-out: As pointed out by Christensen in his seminal book 'The Innovator's dilemma' (Christensen, 2003), spin-offs offer the opportunity to solve the resource allocation conflict between established market service and new product development, and also contain the risk.

5.5 Stage five: Decline

5.5.1 Characteristics and challenges

Decline may not be the fifth stage in sequence but may happen at any time of a company's life-cycle. It may be due to internal or external reasons, that growth is stagnating or actually negative. Before the venture eventually goes out of business, innovation may play a crucial role. Apparently, things did not work out the way it was done so far, so new ways are necessary to turn things around. New functions might appeal better to disappointed customers, new products might find new customer segments, new business models may better address the market needs, and lastly new organizational models might improve the organizational ability to deal with the challenges that led to the decline. Maybe the despair induced by decline can help the adoption of more radical innovations that would otherwise be abandoned.

As mentioned, decline scenarios cannot be generalized to same degree as other growth phases. The reasons for decline are too diverse and also the companies that face decline may be in very different situations. In order to be able to analyze and draw conclusions, a concrete, more narrowly defined scenario is considered: a fundamental sales crisis. The sales revenue is declining, customers move on to competitor's products, sales initiatives like marketing programs or rebates don't show the desired effects. Finally, big losses are accrued and some staff has to be fired. It becomes apparent that only a radical change in products as well as internal processes will be required to achieve the turn-around of the crisis.

5.5.2 Idea Generation

Internal idea generation must not be dried out by a *depressive mood and lack of perspectives*.

External ideas: it may be challenging for a struggling organization to take-in external ideas because of *too much focus on internal problems*, but maybe there is no other chance.

Cross-pollination: In a severe situation people tend to pull more closely together, which might also be the case for declining companies. In such a scenario, building on ideas of

other remote areas of the firm should become more probable, as long as the *awareness* is given.

5.5.3 Conversion

The **selection** of innovative ideas to fund is very challenging in a decline scenario.

The **development** of the innovation is likely urgent, as the future of the firm might depend on its result. People might pull together and join forces to make it possible.

5.5.4 Diffusion

In the declining scenario it is important to bring change to all layers of the company. New procedures and methods have to be **spread** in every corner of the company. Old habits have to be overcome and rigid structures have to be broken up, which is tough due to *internal resistance*.

5.5.5 Recommendations

Table 6 provides an overview over the challenges and the recommendations for this stage.

Table 6: Challenges and recommendations for the Decline stage

Stage five: Decline			
		challenges	Recommendations
Idea generation	In-house	Depressive mood and lack of perspectives	Strong leadership Idea contest
	Cross pollination	Lack of awareness	Best practice scouts
	External	Too much focus on internal problems	Actively seek external advice
Conversion	Selection	Challenging selection scenario	Bold decision
	Development	Urgency	Focus
Diffusion	Spread	Internal resistance	Strong leadership

Idea contest: Pressing issues may actually induce new ideas. Idea contests may be called out in order to tap on the innovative potential of the employees.

Best practice scouts: Employees should be nominated to look for best practice examples, where even in declining overall climate, extra-ordinary successes are achieved, and how those could be leveraged for the company as a whole.

Actively seek external advice: Could be advice from consultants, lessons learned from observation of competitors, or results from research cooperations that had long been shelved.

Bold decision: As the funds are shrinking, allocating resources may be a gamble. Maybe all bets have to be placed on one idea. Obviously, the decision should involve all required stakeholders and the options should be investigated with much rigor considering opportunities and risks, but then the decision should be taken boldly and implemented with dedication.

Focus: If the future of the firm depends on the outcome of an innovation process, all efforts must be focused to this undertaking. The sense of urgency might be used to motivate people to extraordinary efforts.

Strong leadership: Achieving the change goals may be tough due to the strong internal resistance but seems necessary. Strong leadership will be required to overcome the resistance, and a thorough communication of goals and targets.

6 Summary and discussion

6.1 Summary of findings

Table 7 provides a summary of proposed recommendations over all stages of the life-cycle. The recommendations have been summarized from all blocks of the innovation life-cycle, duplications have been removed, and they have been re-arranged in a way that the stages can be compared to each other: recurring items are shown in the same line, new items are added below. This overview enables the observation of some patterns.

In later stages, additional recommendations are given, except for the decline stage. It can be argued that with increasing size and complexity of the company, the challenges for effective innovation management become larger. Most of them are related to the increased geographical distribution of the company as well as the growing degree of departmentalization. However, larger companies also have more possibilities to react in ways that smaller companies may not, for example to spin-out a small venture.

It becomes apparent that the newly founded start-up in the *Existence* stage, where the organization still revolves mainly around the single entrepreneur is a unique scenario of a company that is strikingly different from further stages of development. This implies that some management tools that are recommended there are not mentioned later, not because they are not important any more, but because they are superseded by other structures and tools.

In the initial growth phase that follows break-even, the *Survival* stage, it is crucial to maintain the innovative culture, and not fall in the trap of focusing too much on exploitation. At this stage, the foundation for the future company is laid out, as several management structures are defined in that stage, and that should include an appropriate foresight and innovation strategy. While entrepreneurs and venture capitalists might rather be focusing on the exit strategy, if the company should remain independent, such strategic provisions are necessary to provide sustained success on the long run.

Table 7: Summary of recommendations per stage

Stage One: Existence	Stage two: Survival	Stage three: Success	Stage four: Renewal	Stage five: Decline
<p>Idea repository</p> <p>Business Opportunity Navigator</p> <p>Meeting moderation techniques</p> <p>Training of employees on decision making and risk analysis</p> <p>Focus</p>	<p>Maintain innovative company culture</p> <p>Ensure communication between the teams</p> <p>Employ all modern modes of communication</p> <p>Foresight and innovation strategy</p> <p>Design NPD process</p> <p>Prepare to cannibalize your own products or services.</p>	<p>Maintain innovative company culture</p> <p>Ensure communication between the teams</p> <p>Employ all modern modes of communication</p> <p>Foresight and innovation strategy</p> <p>Design system of inter-related NPD processes</p> <p>Cannibalize your own products or services.</p> <p>Engage in open innovation activities</p> <p>Ambidexterity</p> <p>Install innovation champions and sponsors</p> <p>Incentives for company-wide ideas</p>	<p>Maintain innovative company culture</p> <p>Ensure communication between business units</p> <p>Design system of inter-related NPD processes</p> <p>Foresight and innovation strategy</p> <p>Design system of inter-related NPD processes</p> <p>Cannibalize your own products or services.</p> <p>Engage in open innovation activities</p> <p>Ambidexterity</p> <p>Install innovation champions and sponsors</p> <p>Incentives for company-wide ideas</p> <p>Incentives for external collaboration</p> <p>Improve absorptive capacity</p> <p>Clear mission and vision</p> <p>Spin-out</p>	<p>Strong leadership</p> <p>Actively seek external advice</p> <p>Best practice scouts</p> <p>Idea contest</p> <p>Bold decision</p> <p>Focus</p>

Stages three *Success* and four *Renewal* are rather similar in terms of problems which can largely be attributed to the geographical distribution of the company as well as the growing degree of departmentalization. The difference may be found in the description of the *Success* stage, where growth rate is declining because the initially pursued market niche is dominated and further growth would require to leave the niche. A company that followed through on the innovation focus in earlier stages, as proposed in this work, might be able to skip the *Success* stage of slowing growth and directly continue to the *Renewal*, tapping additional growth opportunities right away and continue on the growth trajectory.

Ambidexterity is recommended for stages three and four. This does not imply that smaller companies cannot or should not be ambidextrous. However, at least structural ambidexterity requires a certain minimum size to make sense. It is considered that only a company that has outgrown the initial phases of market ramp-up can afford to set apart a separate team to focus on an innovation without harming the operating organization. However, contextual ambidexterity can be employed in any stage, either as a permanent or as project-based setup (Mattes and Ohr, 2013).

The *Decline* stage has a similar number of recommendations like the *Existence* stage. At least by the way the *Decline* stage is interpreted in this work, certain similarities between a start-up in the *Existence* stage and a declining company can be observed: both have to focus their efforts on a single opportunity that must provide the turn-around. While the start-up fights a naturally occurring cash burn at the beginning of a development, the declining company has to stop cash-burning activities and rather concentrate on profitable ones, as well as new initiatives; a situation where entrepreneurial thinking may be of good help.

Finally some common recommendations for maintaining the innovative edge in the company are condensed and summarized in the following bullet list:

- Maintain an innovative culture
 - Encourage entrepreneurship
 - Ensure second-loop and third-loop learning
 - Provide organizational slack, accept a certain amount of skunk-works, bootlegging, etc.
- Decision making guided by Strategy + Foresight
- Willingness to cannibalize / disrupt yourself
- Good project management for implementation
- Ambidexterity in various forms, e.g.:
 - Put the innovation in an organization for which it matters (safe havens, reservations, separate business units, spin-outs...)
 - Dual approach as proposed by Galbraith (1982b): innovating organization + operating organization + good transfer process

6.2 Limitations of the research

The following limitations apply to this work: The discussion was based on life-cycle stage models, that have strongly been contested, for example by Levie and Lichtenstein (2010). Each stage has been described employing approachable scenarios, but no empirical evidence is provided about how well the stages can be generalized and applied to a wide set of companies. This is one of the major points of criticism to stage models in general (e.g. Levie and Lichtenstein, 2010). The problems for each stage as well as the respective recommendations are deducted in a manner that might be criticized as being non-systematic and subjective. No case studies have been performed to support the concepts, however great care was taken that the concept is consistent in itself and not contradicting dominant thought models in extant literature.

6.3 Conclusion and outlook

The author hopes to contribute to the concept models of innovation management for growing companies by employing a novel framework analysis. Five life-cycle stages have been synthesized from three major growth models. The application of the innovation

value chain to drive the analysis of problem areas for each stage provides unique insights. Actionable recommendations for the design of innovation management systems for each phase are being provided.

This work may be used as a basis for further theoretical studies. An interesting point of view would be if the dynamic states approach, proposed as an alternative to stage models by Levie and Lichtenstein (2010) would provide similar insights.

Empirical studies could be done to assess to which degree the problems are actually encountered by companies, and how they are answered. The effectiveness of the proposed recommendations in achieving innovation success should be measured.

7 Bibliography

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Annex

Recommendations to improve absorptive capacity (Daghfous, 2004)

- * Companies should be committed to the goal of enhancing and leveraging their knowledge by investing resources (i.e., financial, human, and time) in learning programs and by enhancing the level of knowledge of their employees. Firms should, however, understand that returns on such investments may take a long time to materialize. Therefore, they should not give up on such investment just because immediate increases in profits are not apparent.
- * Firms should encourage employees to communicate across functional boundaries, to brainstorm for new product ideas, and to identify and solve shared problems as a team, rather than leaving this to top management.
- * Firms need a true commitment from top management to create a learning organization. They could start by giving employees leeway and not burdening them with too much work and too many deadlines.
- * Organizations should promote a culture that is open to change. Employees should not be afraid to suggest improvements or changes to the status quo. They should also be allowed to experiment with new production methods.
- * Build physical and virtual knowledge marketplaces such as chat rooms and intranets so employees can get together and communicate outside their daily work activities. Allow adequate time and space for knowledge acquisition creation and sharing.
- * Include knowledge sharing as a criteria of performance evaluation, so that employees who are the best knowledge creators and sharers receive financial rewards and management recognition. This will discourage knowledge-hoarding cultures that prevent the successful implementation of knowledge management initiatives. Also include formal personal development as a criteria in the employee appraisal system.
- * Conduct internal seminars and workshops to share organizational knowledge through informal means, and promote open communication to facilitate intra-firm knowledge transfer.