Shopping for Innovation

A Startup Selection Guide

Master Thesis submitted in fulfillment of the Degree

Master of Science

in New Media and Information Management

Submitted to Dr. Marta Sabou

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AFFIDAVIT

I hereby affirm that this Master's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

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1st of July 2019

Date

ABSTRACT

In a world of digitalization and amplified risks of disruption, successful innovation became a matter of survival. To stay competitive companies, do not only rely on internal R&D but increasingly focus on open innovation. However, their ability to professionally manage the search, selection, and integration of outside innovation is limited. With ever higher numbers of startups scouted the main bottleneck for success in open innovation moved from scouting to the selection of startups.

Nevertheless, only very little was published to support practitioners in this task. The gap in literature and the lack of studies and theory on startup selection is widely acknowledged and bemoaned (Goffin & Mitchell, 2017, p. 62)(West & Bogers, 2014, p. 820) (Cui et al., 2012, p. 29)(Kim & Viswanathan, 2019, p. 348)(Huang & Pearce, 2015, p. 634)(Knockaert et al., 2010, p. 357).

The thesis aims to address this gap and to answer the question of how startup selection can be solved more effectively and efficiently. It addresses questions about the right innovation strategy, processes, scouting sources, selection criteria, and methodologies and about the available tool support for selecting startups.

To answer these questions, an explorative study based on the current (open-)innovation literature and semi-structured expert interviews with innovation leaders of large international corporates and VCs were chosen. The data was evaluated following Mayring´s method of qualitative content analyses.

It was found that even though innovation leaders see the importance of innovation and the risk of disruption investments made do not fully reflect this. Only about one-third of investments go into open innovation and only little more than one quarter into more radical or transformational projects. Larger companies get hundreds to thousands of startups visible and in average use more than six scouting sources. It showed that financial methods do only play a minor role in startup selection while scoring and stage-gate processes prevail. Selection criteria like the strategic fit and team leadership were used most frequently. In average more than seven departments were involved in the selection process, and it was found that external curators play a vital role.

The thesis suggests a startup selection framework which puts startup selection into the context of innovation strategy, innovation process, and the organization. It offers a critical discussion of portfolio theory, financial and non-financial selection methods, and possible behavioral biases in the selection process. The study provides an in-depth analysis of the available software tools for startups selection. A model for an ideal future innovation management platform is presented. The study concludes by giving a practitioner's guide to startups selection.

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LIST OF ABBREVIATIONS

AHP - analytical hierarchy process

AI – artificial intelligence

API – application programming interface

B2B – business to business

B2C – business to customer

CEO – chief executive officer

CInO – chief innovation officer

CIOs - chief innovation officer

CM – content management

CRM – customer relationship management

CVC - corporate venture capital

DCF – discounted cash flow

DNA - deoxyribonucleic acid

DTA – decision tree analysis

ECF – expected commercial value

FMCG - fast moving consumer goods

ICT - information and communication technology

IIR – internal rate of return

KM- knowledge management

NPV – net present value

OI – open innovation

POC – prove of concept

Q – question in the interview guideline

R&D – research and development

RQ – research question

SRM – startup relationship management

SW – software

T - thesis

TBE – time to break even

UI – user interface

UX – user experience

VC – venture capital

VUCA - volatile, uncertain, complex, and ambiguous

1 INTRODUCTION

The introduction will inform the reader why the author has chosen the topic (Section 1.1), why it is relevant on a micro- and macroeconomic level and how it contributes to the new science of innovation management (Section 1.2). The aim of this work and the scientific questions are introduced in Section 1.3 and a high-level picture of the chosen methodology is given in Section 1.4. Finally, the structure of the thesis is introduced in Section 1.5.

1.1 Context and Motivation

During many years in leading positions in the Consulting, Banking, and the IT industry, the author examined the purchasing behavior of his customers, who were large European corporates. In recent years, larger firms seemed to have reached a high level of professionalism when it comes to acquiring commodities such as laptops or standard software (SW), whereas the main challenge shifted to how to purchase innovation.

This lead the focus of this thesis to innovation management and open innovation, as an emerging challenge for enterprises.

Despite the fact that large corporates see the necessity to innovate and are aware of the danger of being disrupted through technological change and digitalization, the knowledge of innovation processes and the ability to professionally search, select and integrate external innovations remains weak (CBinsights, 2018).

The universe of innovative startups is exploding, which provides established businesses with plenty of opportunities to cooperate or purchase external innovations. However, to choose the right partner or acquisition target is a problem, which neither scientific literature nor practitioners have sufficiently solved (West & Bogers, 2014) (Cui, Loch, Grossmann, & He, 2012).

Therefore, this master thesis shall contribute to the vivid discussion on open innovation by focusing on the problem of how to select startups.

The selection problem is set into the context of the latest literature on innovation management, open innovation, and the innovation ecosystem. Packaged software platforms to support the innovation and startup selection process are also investigated.

A qualitative empirical study tests the thesis that there is a lack of procedural and methodological know-how on how corporations address open innovation and select the right targets. Furthermore, suggestions on how to solve the selection problem and which methods, criteria, and software tools can be used are elaborated.

1.2 Problem statement

To solve the big challenges of our time, innovation is more critical than ever on a macro- and microeconomic level. Highly innovative companies are more successful and companies which are not innovative are regularly wiped from the market. As incumbent companies cannot produce the necessary innovation within their own walls, they look outside to acquire innovation through cooperation or acquisition of more nimble startup companies. Although managers acknowledge the importance of innovation and open innovation, their knowledge of innovation processes and their ability to select the right startups still seems underdeveloped.

1.2.1 Increased Importance of Innovation and Enhanced "Creative Destruction"

Innovation has a strong positive impact on the macro and micro level of an economy.

"Innovation is central to improvements in living standards and can affect individuals, institutions, entire economic sectors, and countries in multiple ways"(OECD/Eurostat, 2018, p. 18).

"It almost goes without saying that business success in a developed economy depends heavily on technological progress—and that technological innovation drives technological progress" (Helfat, 2006, p. 86).

In times of accelerated technological change, the ability to innovate is a critical skill for long term survival and determines the profitability of organizations.

There is clear evidence that the longevity of companies is decreasing (Anthony, Viguerie, Schwartz, & Landeghem, 2018). In the 2018 Corporate Longevity Forecast the authors summarize:

"• The 33-year average tenure of companies on the S&P 500 in 1964 narrowed to 24 years by 2016 and is forecast to shrink to just 12 years by 2027 (Chart 1).

• Record private equity activity, a robust M&A market, and the growth of startups with billion-dollar valuations are leading indicators of future turbulence.

• A gale force warning to leaders: at the current churn rate, about half of S&P 500 companies will be replaced over the next ten years" (Anthony et al., 2018, p. 2). Figure 1-1 shows the average lifespan of S&P companies as measured and predicted by the authors.

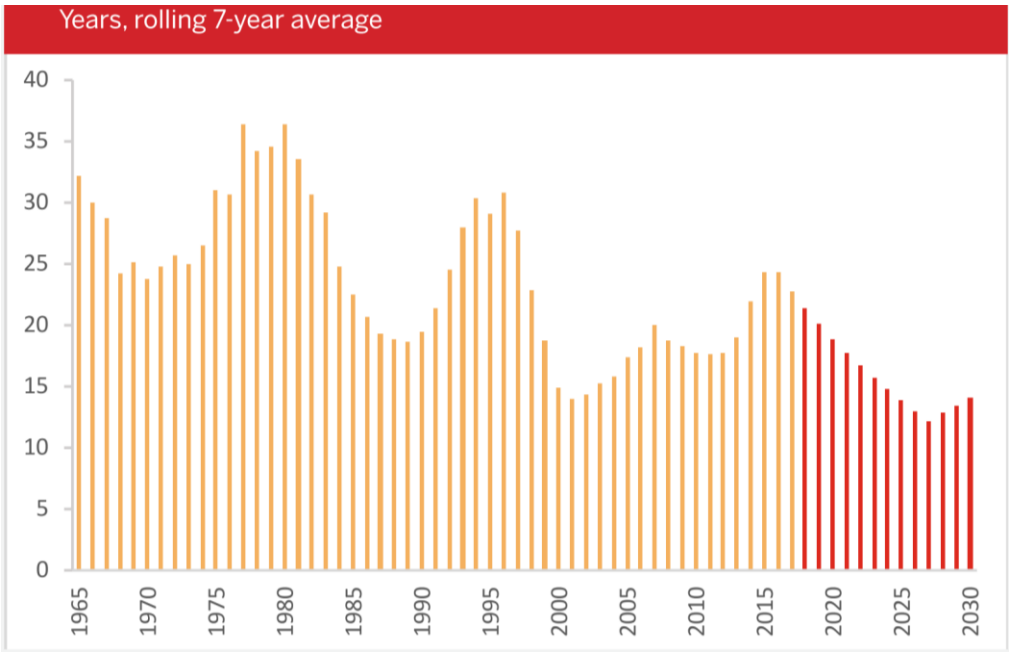


Figure 1-1 Average Company Lifespan on the S&P 500 Index (Anthony et al., 2018, p. 2)

The trend is especially true for more recently listed companies. Govindarajan sees the root cause in their digital business model, which can be imitated more easily. He sees remedies in bundling technology and physical products, the incorporation of network effects into the business model, and continual innovation. (Govindarajan & Srivastava, 2016)

The rate of what Schumpeter 1911 called “creative destruction” in his famous book “Theorie der wirtschaftlichen Entwicklung” has widely increased. He describes entrepreneurs as strong individuals who “will create something new and destroy the old thing, conceive and carry out bold plans, which, whatever their nature, seem to ridicule any attempt of being grasped” (Dr. Schumpeter, Becker, & Knudsen, 1911, p. 409) “Innovation is creative and beneficial, bringing new industries, wealth, and employment, and at the same time is destructive of some established firms, many products and jobs, and the dreams of failed entrepreneurs” (Dodgson & Gann, 2018b, pp. 21–22). Modern evolutionary economics recently picked up many of his theories (Klaes, 2004). In his influential book “The Innovator´s Dilemma”, C. Christensen describes disruptive technology as the reason for enhanced levels of creative destruction (Christensen, 1997).

Today everybody is aware of recent examples of bold startups which revolutionize their respective industry. Uber (and self-driving cars) are disrupting the taxi industry, Airbnb the hotel industry; Amazon disrupted bookshops and the IT industry with cloud offerings, YouTube disrupts the music industry and Netflix traditional television to mention a few prominent examples. As S. Ismail the founding director of Singularity University and author of the bestselling book on exponential organizations put it in information enabled environments: “Even traditional industries are ripe for disruption” (Ismail, Malone, & van Geest, 2014, p. 35).

Technologies change with time and often do so in unpredictable ways. Therefore the doyen of Open Innovation Henry Chesbrough brings it to the point “companies that don´t innovate die” (Chesbrough, 2006, p. 185).

In a recent global study amongst 677 executives of large corporates, the innovation analyst CBINSIGHTS found that managers are very aware of the importance of innovation and about the risk of their companies of being disrupted by emerging technologies.

- 84,9% of the respondents stated that innovation is very important and
- 41% stated that their companies are extremely or very at risk of disruption

The most endangered industries are Media & Entertainment, Transportation, and Financial Services (CBinsights, 2018, pp. 9–10) as depicted in Figure 1-2.

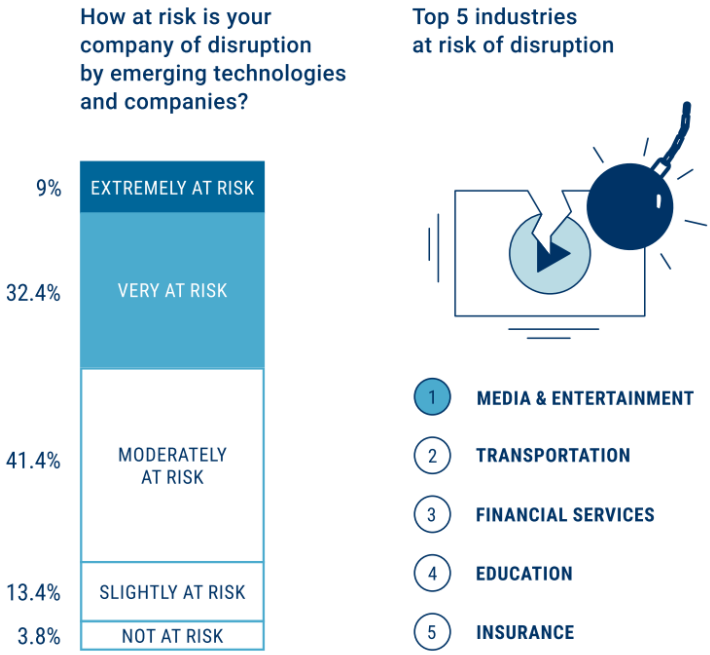


Figure 1-2 Risk of Disruption per Industry (CBinsights, 2018, p. 10)

1.2.2 Innovative Companies Perform Better

A recent study of Accenture conducted among 1.440 C-level executives in 11 industries and 12 countries indicates that a small group of 90 (or 6%) of all companies examined, intensively embraced innovation. This group dubbed “Rotation Masters” reported generating 76% to 100% of their revenues from “new” business activities they started in the past three years. There seems to be a strong correlation between the level of innovation and a company’s performance and growth in sales and EBIT (Abbosh, Nunes, & Savic, 2018) – see also Figure 1-3.

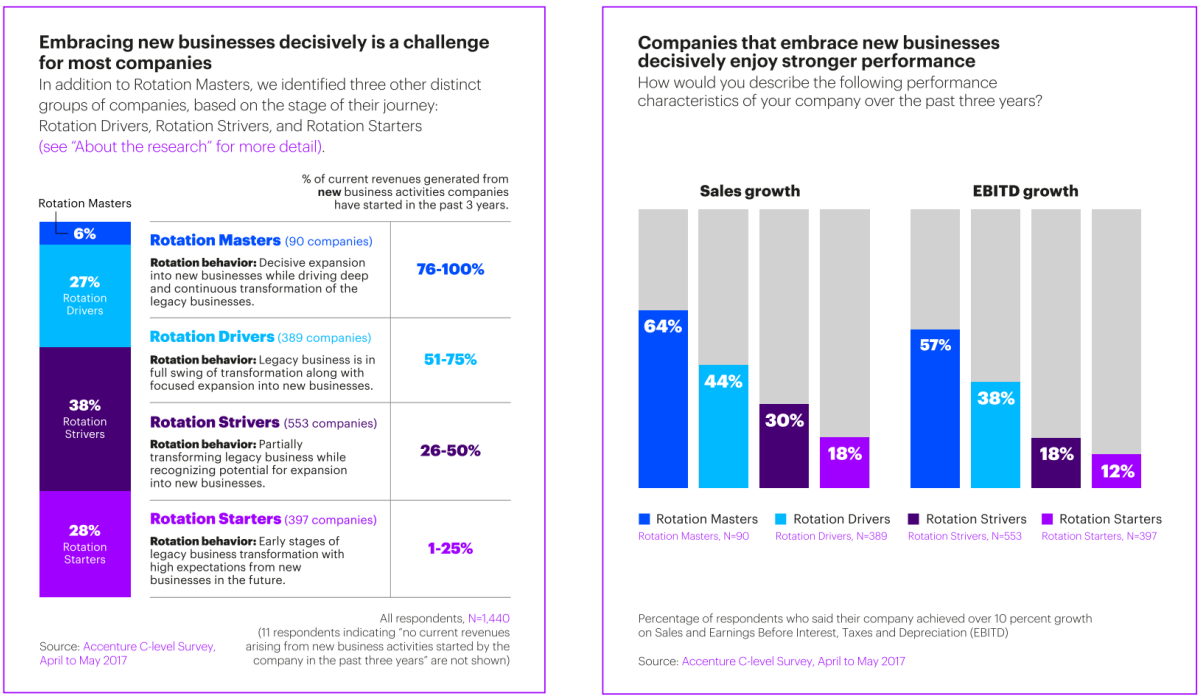


Figure 1-3 Level of Innovation and Performance (Abbosh et al., 2018, pp. 7, Figure 2 and 3)

"Ultimately, Rotation Masters apply their innovation capabilities to enable transformation in their business. They employ a combination of internal and external innovation capabilities. And notably, they tend to prioritize the deployment of crowdsourcing strategies and in-house corporate development teams (who can identify and acquire the right innovation capabilities externally) more than other companies" (Abbosh et al., 2018, p. 15).

1.2.3 Companies Increasingly Look for Innovation Outside

In his hugely influential book on Open Innovation, Henry Chesbrough (2006) observed and described a fundamental shift in the paradigm of how large companies approach innovation. The shift from what he calls "*Closed Innovation*" which focused entirely on internal R&D driven production of innovation to "*Open Innovation*" which incorporates innovation from outside the company and makes internal innovation available to be used outside the company.

Chesbrough sees the root cause for this shift in 4 factors (Chesbrough, 2006, p. 34ff):

1. **The Increasing Availability and Mobility of Skilled Workers.** More and better educated and talented engineers can and will more often change companies, join consultants or startups.
2. **The booming Venture Capital Market,** which makes it easy for skilled entrepreneurs to fund and raise their innovative ideas in their startups. Large companies find it increasingly hard to match the earning opportunities of innovative startup firms which tempt talent with attractive stock option packages.

3. **External Options for Ideas Sitting on the Shelf**. In the Closed Innovation, paradigm ideas often were stored after being developed in the research department and had to queue and wait until implemented by the development department. Mainly due to the two factors described above, there is always the risk or opportunity of these ideas being taken to market outside the company. “If a company´s internal development organization is not ready to use a new research result, it cannot blithely assume that the result will always remain on the shelf, available whenever the development group chooses to work with it. Disillusioned employees, possibly financed by VC, have other ways of commercializing their ideas” (Chesbrough, 2006, p. 38)
4. **Increasing Capability of External Suppliers**. Also, due to a combination of the factors above, suppliers can often offer equal or superior quality to what the company can deliver internally. This can lead to disaggregation in the value chain.

Today companies have an overwhelming choice in finding new innovative startups to cooperate or invest in.

Even though there is no complete worldwide statistic on entrepreneurial activity due to several countries not collecting and providing such data, there is plenty of evidence that the number of startups grows each year. Worldwide one could estimate that 100mio. new businesses start each year (Mason, 2011). The most comprehensive data source the Global Entrepreneurship Monitor states in its latest edition “An important global trend that has been observed during the last few decades is that entrepreneurship activities continue to grow all over the world. In many countries in which the decision to start a new business was traditionally triggered by necessity, an increasing share of entrepreneurship is now triggered by opportunity. The new digital technologies can certainly explain a large portion of this shift” (GERA, 2018, p. 4).

1.2.4 Company Professionalism in Innovation Management is Still Poor

Despite the fact that most top managers see innovation as important and see substantial risks in being disrupted, the professionalism of how companies go about innovation is still poor, according to a recent study of CBinsights amongst more than 600 large corporations (CBinsights, 2018).

Innovation Management is still a young discipline as a new study of KPMG together with Innovation Leader LLC amongst 270 executives responsible for this topic in large corporates revealed: teams are still small and under-resourced and “in order to compete with a fast-moving, nimble, hungry pack of competitors – there is much work to be done” (Farell, Drummond, & Bolen, 2018, p. 6). According to the CB Insights study, 57% of companies do not even follow a formal innovation process. (CBinsights, 2018, p. 22).

Even though top managers preach Open Innovation, a big chunk of investment still goes into internal or closed innovation. “Overall, respondents said their companies are 2.8x more likely to build than to buy when asked, “Please rank your company’s orientation toward creating innovation” (CBinsights,

2018, p. 25). According to the authors, this is one of the reasons why corporate innovation is so slow "60% of companies say it takes a year or longer to create new products, with almost one-fourth saying it takes over two years from ideation to launch" (CBinsights, 2018, p. 26).

Executives also lack confidence when asked how effective their companies are in the main phases of the innovation process (CBinsights, 2018, p. 27). This might lead to many departments being involved in startup deals, which further slows down the process. In a study of over 100 corporate innovation professionals of Fortune 1000 companies, the authors found that "corporations identified more than 10 departments that are involved in startup deals. To keep startup engagements on track, corporations need to align stakeholders, objectives, and resources early and often" (YOUNIS, DESAI, & SIGAL, 2017, p. 6).

Lack of confidence seems to be even more true for board members. A recent study covering 5000 board members found that "Boards' abilities to foster innovation clearly fall short when compared with their other activities" (Cheng & Groysberg, 2018, p. 3) and that although board members rate innovation amongst their companies' top five strategic challenges "board members rate their boards better on risk management than on innovation" (Cheng & Groysberg, 2018, p. 3). Table 1-1 shows that board members rate their capabilities on innovation as rather low compared to other activities.

Figure 1-4 Boards Lack of Innovation and Technology Skills (Cheng & Groysberg, 2018, p. 3)

The Governance Activities and Processes Boards Are Good At

Technology and innovation rank low on the list.

% of board members who rated rated each activity "above average" or "excellent"

Staying current on company	70%
Compliance	69
Board composition	67
Financial planning	66
Staying current on industry	64
Executive sessions	60
Overall board performance	59
Monitoring strategic decisions	59
Investor/shareholder relations	58
Strategic planning	56
Risk management	55
Creating effective board structure	55
Time management	52
Evaluation of CEO	51
M&A	45
Compensation	45
Technology	**42**
Innovation	**42**
Global expansion	40
CEO succession planning	36
HR/talent management	35
Evaluation of individual directors	34
Cybersecurity	24

It is also stunning that even though companies are aware of the risk of being disrupted, they invest only very little in disruptive or radically new ideas but allocate most of their budgets in small and incremental innovation. “On average, companies invest 78% of their innovation budget in continuous improvements to existing processes and products. But high-performing companies tend to invest more in disruptive innovation” (CBinsights, 2018, p. 16). This result is also supported by the study of Innovation Leader together with KPMG, which found only 23% of all innovation efforts were focused on transformational projects (Farell et al., 2018, p. 8).

1.2.5 The Startup Selection Process is Still Insufficiently Investigated and Executed

Especially the selection phase in open innovation is crucial for the ultimate success. Nevertheless, only very little has been published to support practitioners in this task. This gap in literature and the lack of studies and theory on the topic of startup selection is widely acknowledged and bemoaned by scientists and practitioners (Goffin & Mitchell, 2017, p. 62)(West & Bogers, 2014, p. 820) (Cui et al., 2012, p. 29)(Kim & Viswanathan, 2019, p. 348)(Huang & Pearce, 2015, p. 634)(Knockaert et al., 2010, p. 357).

A recent study of the Stanford Institute for Economic Policy Research shows that the productivity of innovation decreases while its costs skyrocket. The authors “present a wide range of evidence from various industries, products, and firms showing that research effort is rising substantially while research productivity is declining sharply” (Bloom et al., 2017, p. 1). One of their examples is the very popular Moor´s Law, which observes that the density of computer chips is doubling every two years. The authors show that to achieve this today, 18 times more researchers are necessary than in the early seventies. To overcome such inefficiencies, companies look for innovation outside their R&D departments and to select the right partners to innovate.

Cooperating with and investing in startups is risky. Most startups fail. There are plenty of business articles published which state the word of the mouth truth that 90% of all startups fail. The most comprehensive scientific analyses conducted based on data of more than 3200 tech startups coauthored by researchers from UC Berkeley & Stanford found that even those which survive might have to overcome several near-death experiences in their early stages. (Marmer et al., 2012, p. 4). A good selection process can reduce the risk of a failed investment by a high margin.

The high risk of failure and the need for a good selection process also applies to startup integration projects in large corporates. Only a few startups get successfully integrated into the company. A recent study amongst 100 executives of Fortune 1000 companies showed that “The vast majority of corporates see less than 25% of their initial pilots with startups scale into solutions that can be taken to market” (YOUNIS et al., 2017, p. 24). One reason for this is a weak selection process.

In their review of 291 open innovation publications, J.West and M.Bogers spot specific research gaps. They say, "A major challenge for firms relying on external sources of innovations is how to effectively identify the most valuable innovations" (West & Bogers, 2014, p. 820).

Literature provides only very limited indications on how the selection process in open innovation can be managed or which selection criteria shall be chosen (Cui et al., 2012, p. 29).

As Goffin and Mitchell sum it up in their book on innovation management "there has been a huge amount of academic research on OI in the past 10 years. This has served to give structure to the subject and clarify what can be done, although without, as yet, giving much guidance to practitioners on how to do it well" (Goffin & Mitchell, 2017, p. 62). This gap shall be addressed within this Master Thesis.

1.3 Research aims and scientific question

The **thesis aim**s to **give innovation managers and practitioners help and guidance to select the right startups** by:

- refining their innovation strategy
- creating a rich deal flow by using appropriate sources to scout and find startups
- choosing the appropriate startup selection methodology and criteria
- appointing the best-suited selection teams
- getting improved IT support

The results of this study will also be instrumental in developing specialized software tools to support innovation management and especially the startup selection process.

The **central scientific question** of this thesis is:

“How can the startup selection problem in open innovation be solved most effectively and efficiently?”

To investigate how this can be achieved the following six sub-questions are explored in this master thesis.

Sub-question 1: How can innovation strategy support the selection of startups?

Each startup selection project needs to be guided by an overarching innovation strategy. A good strategy will set the right targets, guide the selection project in the right direction and attribute enough funding to the selection project. This thesis shall shed light on how companies perform in this task. Questions of how companies define innovation, how strategically important they perceive it and how much they budget for various forms of innovation will be investigated and critically discussed. The results shall enable practitioners to critically reflect and eventually adopt their own innovation strategy to help the success of their startup selection program.

Sub-question 2: Do companies follow a clear innovation process to support startup selection?

Startup selection can only work if it is embedded in a well-defined and functioning innovation process. This thesis aims to find out whether such processes exist, which steps in the process are perceived as important and which as difficult to master. Best practices shall be discovered.

Sub-question 3: Where do companies find the right startups and how much scouting is needed?

Before selecting startups, companies need to go out and find the right quantity and quality of them. This thesis will investigate which sources to find startups can be used and which are best suited. Some first benchmark numbers on how many startups shall be scouted and which success rates could be expected shall be examined.

Sub-question 4: Which methodologies and criteria are best suited to select startups?

To select the right startups, questions of methodology and appropriate selection criteria must be solved. As shown in the introduction in Section 1.2.5 there is a gap in literature and theory on how to best approach this problem. This thesis shall critically discuss the available methods which are used to select (innovation-)projects in general and their utility for the startup selection. Restrictions of these methods and risks of behavioral biases in this process shall be shown. A view which methods and criteria to select startups are used by leading experts shall give some best practices which help practitioners in future startup selection projects.

Sub-question 5: Who is and shall be involved in the selection process?

This thesis will also shed some light into who is involved in the selection process and at which level of the organization. The question if and which kind of external curators are helpful shall be investigated. This could help practitioners to find the right team supporting the startup selection.

Sub-question 6: What is the current and the desired tool support for the selection process?

There is a growing number of innovation- management tools and some first SW solutions target to help companies and investors to finding and selecting startups. A high-level overview of the market, the players and the trends shall make new options visible for the practitioner. Expert opinions on what is needed in the future shall give indications for-enhancements of homegrown or packed SW solutions.

1.4 Methodological Approach

To support the research-aim and to answer the scientific questions portrayed in Section 1.1 a methodological approach resting on the following two pillars was chosen:

- Literature Research and
- Semi-structured Expert Interviews

Literature research played a stronger part in the first phase of creating this master thesis, but it kept contributing to refine and enrich the findings of the later qualitative expert interviews.

Although there was only very little literature and theory on startup selection (see Section 1.2.5) literature could provide more general innovation frameworks which helped putting the startup selection process in the right context. The rich literature on how to select (innovation-)projects in general served as a starting point to discuss the more specific question of startup selection. Recent studies contributed to find some first (hypo-)thesis on how companies treat innovation strategy, innovation processes and the players in the innovation ecosystem who contribute to startup selection. Some rare articles and Internet research gave hints on which selection criteria might be used or which tools to support innovation and startup selection are available. As a result of the literature study 14 (hypo-)thesis describing the status quo of how companies handle innovation strategy, find startups and select them could be formulated (see Section 2.6).

To test the (hypo-)thesis derived from the literature review and to explore how leading practitioners approached the startup selection problem a qualitative study using semi-structured expert interviews was chosen. This also aimed to find some best practices.

To answer the research questions and to test the (hypo-)thesis derived from literature research the expert interviews focused on the following key topics (see Section 3.5):

- Definition and Importance of innovation
- Investments in internal innovation (R&D) vs. open innovation (startups)
- Risks of being disrupted and how much is invested in incremental vs. disruptive innovation
- Difficulties in the innovation process
- Sources to find (scout) the right startups
- Number of startups evaluated, and successful projects implemented
- Methods and criteria used in the selection process
- Persons involved in the innovation/selection process
- Current and desired tool support

1.5 Structure of the thesis

This master thesis is structured as follows.

Chapter 2 elaborates the **theoretical framework** of this master thesis. The basic terms of innovation are defined, and popular innovation frameworks are explained and applied to the startup selection problem. It is described how companies can deal with startups and which players dominate the (open-)innovation ecosystem. Theories and methodologies to select innovation and their usability for solving

the startup selection problem are discussed. As a result, 14 (hypo-)thesis could be formulated which could be tested in the empirical part of this master thesis.

Chapter 3 describes the **methodologies** applied to solve the scientific questions in this master thesis. The scientific process is laid out, and the section discusses how the literature research and the expert interviews were performed. The link between the (hypo-)thesis and the interview guideline is explained, and it is described how questions of pilot testing, sampling, data collection, and data analyses were solved.

In **Chapter 4** called **research and discussion,** the main results of the qualitative research at hand are disclosed and discussed. Its sub-sections describe how the experts in the sample:

- understand Innovation and its Importance
- see the risk of disruption and investment in different forms of innovation
- execute the innovation process and how professionally they perform it
- search for startups
- select startups
- use innovation management software and which future tool support they would wish for

Chapter 5 concludes the thesis. It summarizes the overall learnings giving a brief guideline for practitioners on how to best manage startup selection. Chapter 5 also discusses the scientific contribution and the implications for the main stakeholders. The limitations of the research are discussed and an outlook to future research is given.

2 THEORETICAL FRAMEWORK

The focus of this thesis is the selection problem in the open innovation processes. As a first step, the terms innovation and open innovation are defined as part of Section 2.1 which is dedicated to introducing the relevant concepts and terminology.

There is still not yet a comprehensive theory on innovation. Therefore, two prevalent innovation frameworks are described and applied to the main scientific questions guiding this work (Section 2.2). As a framework for open innovation, the heavily discussed open innovation paradigm of Chesbrough is referred to (Chesbrough, 2006). The innovation pentathlon framework suggested by Goffin and Mitchells (Goffin & Mitchell, 2017) is used as a general framework for innovation and applied to the startup selection problem. These process-centric descriptions of innovation give the context in which the selection of startups takes place. The various steps in the innovation process as described in these frameworks and their influence on the selection of startups are discussed.

When large corporates intend to purchase or outsource innovation, they act as a part of a lager innovation ecosystem. They might create or cooperate with innovation centers, accelerators, incubators, (corporate) venture capital firms, coworking spaces or organize hackathons and other innovation events. As these institutions are instrumental to scout and select startups for corporates, the most important players in the innovation ecosystem and their role in the innovation and startup selection process are described in Section 2.3.

Most importantly, in Section 2.4, the available theories and methods supporting the selection of innovation are reviewed and their value for the startup selection is discussed. A specific Sub-section 2.4.1 is dedicated to the limitations of intuitive judgment. Financial and non-financial methods are described and discussed concerning their ability to support the selection of innovation projects and their potential to also help in the more specific problem of selecting startups.

Finally, the available software tools supporting the innovation process and the startup selection process were investigated and analyzed in Section 2.5.

2.1 Terminology

When talking about selecting startups for open innovation, it is vital to understand innovation and open innovation as basic concepts. Therefore, as a first step before entering the theory part, the terms innovation and open innovation are defined. Based on that, the frameworks and methodologies of innovation and startup selection are examined.

2.1.1 Definition of Innovation

After reviewing 291 publications on innovation, J. West and M. Bogers see the lack of a clear definition of innovation as one of five major gaps in literature (West & Bogers, 2014).

The OECD defines innovation in its latest edition of the Oslo Manual (OECD/Eurostat, 2018) as follows:

"An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)" (OECD/Eurostat, 2018, p. 20).

Definitions of Innovation mostly include the creation of something new and some hint to implementation.

M. Dodgson und D. Gann offer a very condensed definition of innovation as "ideas successfully applied" (Dodgson & Gann, 2018b, p. 13).

The Austrian economist Josef Schumpeter was the first famous economist to put innovation at the heart of his theory. Although developed more than 80 years ago, Schumpeter´s theory is still relevant and encompasses many aspects of innovation. He emphasizes that to create something new, one does not only have to have new ideas but also has to act upon them when he says: "Most people do not see the new combinations. They do not exist to them. […] A minority of people with a sharper intelligence and with a more agile imagination perceive countless new combinations. They look at everyday events with more open eyes and a wealth of ideas suggests themselves on their own. Many people belonging to this minority rescue enough freshness from the daily routine, allowing them to further pursue some of those ideas and give them concrete form. […] Then there is an even smaller minority—and this one acts […] You can always have the new combinations, but what is indispensable and decisive is the act and the force to act" (Dr. Schumpeter et al., 1911, p. 412f). This emphasis of the single, heroic and risk-taking individual of his early work is supplemented by the more formal and organized role of large corporates in the innovation process which is described in his later publications (Dodgson & Gann, 2018b, p. 22).

Till the shift of the millennium, the focus of innovation science and practice was on strong R&D departments and internal sources of innovation, in a paradigm which can be termed as Closed Innovation. Beginning with the new millennium, the paradigm of innovation shifted from being mainly focused on active internal R&D departments and internal sources of innovation to what Henry Chesbrough coined open innovation in his groundbreaking book with the same title (Chesbrough, 2006). In the next section we therefore focus on *Open Innovation*.

2.1.2 Definition of Open Innovation

Chesbrough saw the move towards open innovation as a fundamental paradigm shift in how companies approach innovation. He calls the old paradigm *"Closed Innovation"* and contrasts it with the new paradigm of *"Open Innovation"*. Whereas in his view closed innovation "is a view that says successful innovation requires control. Companies must generate their own ideas and then develop them, build them, market them, distribute them, service them, finance them, and support them on their own" (Chesbrough, 2006, p. Introduction XX). Open innovation "is a paradigm that assumes that firms can and should use external ideas as well as internal and external paths to market, as the firms look to advance their technology" (Chesbrough, 2006, p. Introduction XXIV).

Chesbrough contrasts the principles of closed with those of open innovation as depicted in Table 2-1. (Chesbrough, 2003, p. XXVI Introduction TABLE I-1)

Table 2-1 Closed vs. Open Innovation Principles (Chesbrough, 2006, p. XXXVI Introduction TABLEI-1)

Contrasting Principles of Closed and Open Innovation

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

After Chesbrough's groundbreaking work, there was an explosion in scientific work to examine and even closer define open innovation. J.West and M.Bogers analyzed over 290 publications on that topic (West & Bogers, 2014) and K. Goffin and R. Mitchel call it the most researched topic in innovation counting up to 25 academic papers on the topic each year after 2003 (Goffin & Mitchell, 2017, p. 25).

The framework of open innovation was enriched by and related to literature from knowledge management, organizational learning, and firm boundaries. This is reflected in more recent definitions of open innovation such as the one offered by Ulrich Lichtenthaler who defines open innovation "[…]

as systematically performing knowledge exploration, retention, and exploitation inside and outside an organization's boundaries throughout the innovation process" (Lichtenthaler, 2011, p. 77).

2.2 Innovation Frameworks

At the time of writing this master thesis, it was too early to speak of a profound and consistent theory of innovation. Even recent publications claim: "There is no single unified theory of innovation. There are partial explanations from, for example, economics, political science, sociology, geography, organizational studies, psychology, business strategy, and from within `innovation studies,` which draws on all these disciplines" (Dodgson & Gann, 2018a, p. 26). Nevertheless, some useful frameworks have been established to describe the process and ingredients of innovation. The study at hand will focus on those frameworks and on current studies which contribute to the main scientific questions of this master thesis and leave other approaches unquoted. Especially the innovation pentathlon framework proposed by K. Goffin and R. Michell was applied to fit in other theories and thoughts contributing to the specific question of startup selection.

2.2.1 The Open Innovation Paradigm

The open innovation paradigm by Chesbrough introduced in the previous chapter started to draw the attention from traditional R&D to two other innovation aspects:

- outside-in innovation which is taking external sources of innovation into account and to
- inside-out innovation which suggests offering homemade innovation to players outside the company if the company cannot effectively commercialize it

This master thesis is concentrating on the **outside-in** part of open innovation and asks more profound questions on how external innovation and especially startups can be found, selected, and introduced into the value chain of the company. The similarly exciting question of how companies can leverage and market their own ideas outside their organization is not investigated here being outside the scope of the thesis.

The following graphical representation is inspired by Chesbrough (Chesbrough, 2006, p. 183) and others (Goffin & Mitchell, 2017, p. 61) and the author highlighted the focus areas of the thesis at hand in blue in Figure 2-1.

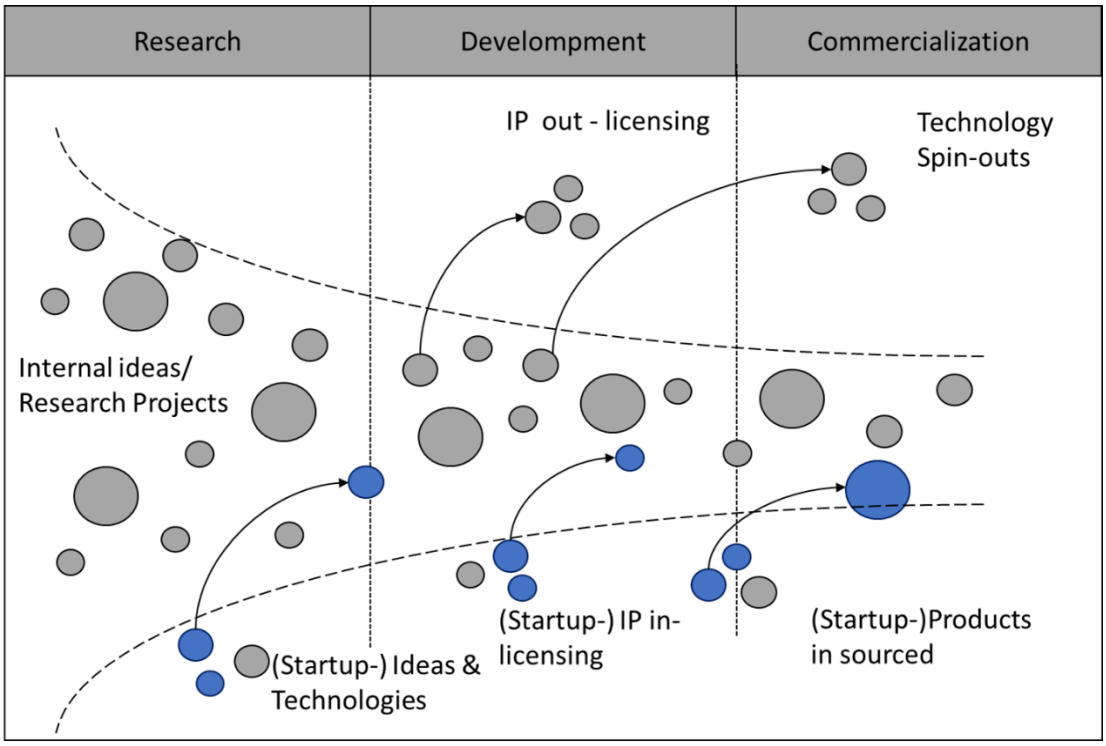


Figure 2-1 Open Innovation Paradigm modified from (Chesbrough, 2006, p. 183) *(Goffin & Mitchell, 2017, p. 61)*

As depicted in Figure 2-1 above, internal ideas moving from research to development and commercialization represent the traditional closed innovation principle. The dotted lines show the boundaries of the organization.

The figure also shows internal ideas or developments which are commercialized outside the company in the form of IP-out-licensing or of technology spinouts. This represents the inside-out part of open innovation.

This thesis, however, concentrates on the outside-in part of open innovation, which is depicted in the lower part of Figure 2-1. Examples are external ideas and technologies used, IP- in-licensing or products insourced. These different kinds of in-sourcing of external innovation can happen in different maturity stages of the process. A focus of this thesis is on developing best practices for finding and selecting startups. This is indicated by the blue color used. The fact that some bubbles in the lower section of the figure were kept in gray and some in blue shall express that for outside-in innovation either startups, but also other sources of innovation might play a role. Examples can be ideas and technologies which get insourced from universities or IP, which is licensed or products which are bought from a larger competitor or vendor.

However already Chesbrough saw the predominant role of sourcing external innovation from startups when he points out that:" A relationship with a start-up is more valuable than the best market research, because you´ll be observing a real company that is making a real product and selling it to real customers, who pay real money" (Chesbrough, 2006, p. 184).

Also current best-selling authors like Mark Payne the founder of Fahrenheit 212 see the importance of startups for substantial innovations when claiming: “Groundbreaking innovations are far more likely to spring from the proverbial garages of startups than from the incumbent leaders of any industry” (Payne, 2014, p. 103).

The different ways for a company to engage with a startup in their open innovation program were only described in very recent studies.

In a study of 100 innovation professionals, the authors found three basic collaboration models (YOUNIS et al., 2017, p. 10):

- *Partnership* – which could take the form of a pure vendor relationship between the startup and the corporation or a co-creation of products or technologies or the co-branding in the form of a marketing cooperation;
- *Acquisition* of the startup by the company;
- *Investment* of the company to receive some shares in the startup either directly or via corporate venture capital or partnerships with accelerators that invest in startups.

2.2.2 The Startup Selection Framework and the Innovation Pentathlon

A popular way to describe innovation is to depict the innovation process, along with its strategic and organizational implications. K. Goffin and R. Mitchell offer an excellent example for such an approach with their “*Innovation Pentathlon Framework*” (Goffin & Mitchell, 2017, p. 29). The framework consists of five building blocks giving it its name (depicted in Figure 2-2):

1. Innovation Strategy
2. Ideas
3. Selection
4. Implementation
5. People, Culture and Organization

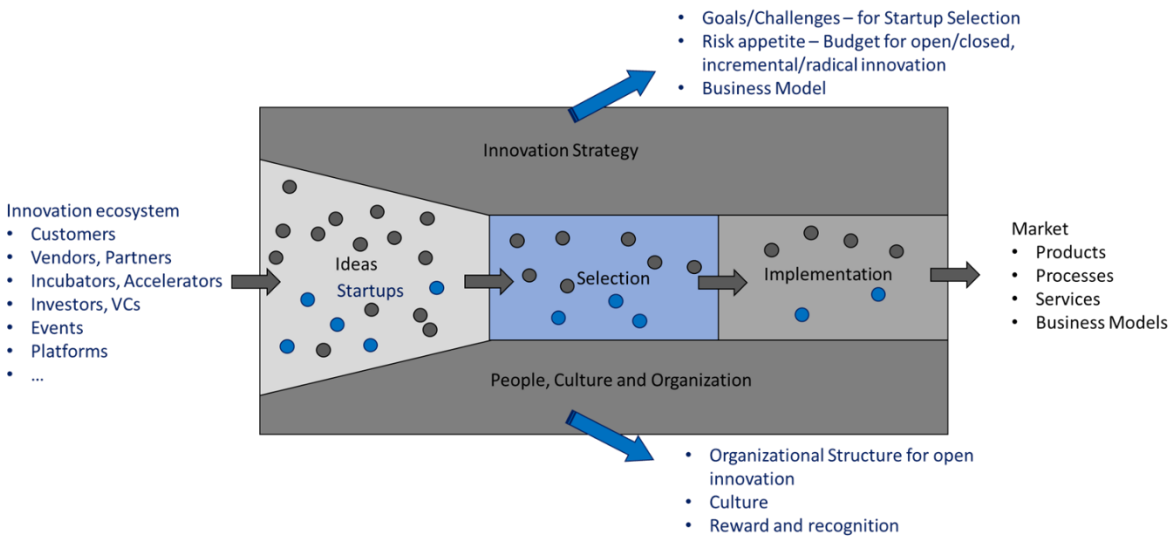


Figure 2-2 Startup Selection Framework – modified from Innovation Pentathlon Framework (Goffin & Mitchell, 2017, p. 29)

The author of this master thesis suggests a **startup selection framework** which is based on the basic structure of the innovation pentathlon quoted above. The framework is enriched and applied to the startup selection problem. The main building blocks are underpinned by recent studies and theories which contribute to this specific question. The value of the innovation pentathlon is in giving structure and context to the narrower problem investigated in this thesis. The blue color in the figure indicates the focus of this thesis.

In this section the main building blocks are elaborated. Central topics such as the innovation ecosystem (Section 2.3), the selection theories and methodology (Section 2.4) and the tool support (Section 2.5) are more deeply discussed in separate sections.

Innovation Strategy

Innovation strategy, as the first element of the innovation pentathlon framework, sets the vision and the goals steering the other elements. It is part of the overall business strategy with the focus on innovation. Concerning open innovation and the cooperation with startups, the author sees three main questions innovation strategy must answer:

- Which business challenges shall be solved by a startup?
- What is the risk appetite of the company and how budgets shall be allocated?
- Which implications does a startup engagement have for the business model of the company?

To **set the goals** for a startup engagement, the innovation strategy needs to **define the business challenges which shall be resolved**. To do so "Innovation strategy must look well into the future because the need for innovative change often comes from slowly developing trends, which may be difficult to recognize and respond to" (Goffin & Mitchell, 2017, p. 144).

Innovation strategists need to take the following drivers of innovation into account (Goffin & Mitchell, 2017, p. 49):

- Technological Advances (recent examples being artificial intelligence or blockchain)
- Intensified Competition (examples are cheaper logistic costs due to the container revolution in shipping or the increasing competition in retail due to e-commerce)
- Changing Customers and Needs (an example is the aging population in Europe or Japan or shifts customer spending due to increased wealth in many countries)
- Changing Business Environments (recent examples are Great Britain's exit of the European Union, new banking regulations following the 2008 crisis and any economic or political changes in general)

Often it is also a charismatic leader pushing for innovation.

Innovation strategy must look ahead and spot the main trends in the respective industry. Based on the study of this trends and the knowledge of the strength and weaknesses and the core competencies of the organization the innovation strategy sets goals for improvement or defines areas of future opportunities which shall be addressed by open innovation. In open innovation, this is often done in the form of specific innovation calls which are posted to various channels to attract startup applications.

Strategic decisions shall specify the maturity level and the field of expertise and technology of startups which shall be scouted. It defines the nature of an ideal portfolio which shall be selected. The innovation strategy also gives guidelines on the implementation.

The next question to be solved by the innovation strategy is about the **size and allocation of innovation budgets.**

Today the importance of innovation for the company must be assessed in the light of risk to be disrupted. C. Christensen who coined the term disruption sees a dysfunctional resource allocation biased towards sustaining technologies as a root cause for frequent failure when he writes that: "[…] most companies […] identifying new products that promise greater profitability and growth are rarely able to build a case for investing in disruptive technologies until it is too late" (Christensen, 1997, p. XXI).

Not only the size of the innovation budget needs to be decided upon but also its split between closed and open innovation and the split between incremental and radical innovation projects (Nagji & Tuff, 2012) (CBinsights, 2018, p. 16) must be decided upon. This, of course, sets the frame in which startup scouting and selection can take place.

Last not least innovation strategy has to decide on the **question of the business model** of the company.

Open innovation and collaboration with startups can massively influence the business model of the entire company. H. Chesbrough already emphasized the influence of open innovation on the business model of the company and its importance when stating that: “technology by itself has no single objective value. […] a mediocre technology pursued within a great business model may be more valuable than a great technology in a mediocre business model” (Chesbrough, 2006, p. 64). Since then, the notion of business model innovation has gained wide popularity, especially since the publications of A. Osterwalder and Y. Pigneur who claim that: “open business models can be used by companies to create and capture value by systematically collaborating with outside partners” (Osterwalder & Pigneur, 2010, p. 109) and that “business model innovation is about challenging orthodoxies to design original models that meet unsatisfied, new, or hidden customer needs” (Osterwalder & Pigneur, 2010, p. 136). D. Teece stresses the importance of the right technology selection for the success of a business model when pointing out that: “the success of a business depends as much on business model design and implementation as it does on the selection of technologies and the operation of tangible assets and equipment” (Teece, 2018, p. 40) .

So existing business models will influence the selection of outside innovation but also outside innovators will bring their business models and affect the business model of the corporation.

Idea Generation and Startup Scouting

Following the traditional closed innovation paradigm, most innovation processes begin with ideation. This follows the notion that “Without generation of ideas, there can be no innovation […]” (Goffin & Mitchell, 2017, p. 153).

To create a huge number of good ideas, the focus was very often on stimulating individual and team creativity and the use of creativity techniques (van Aerssen, 2009). With the proliferation of the open innovation paradigm ideation also opened from the narrow focus on corporate employees to embrace ideas coming from customers, vendors, partners, and startups. Today “More and more companies are shopping outside their organizations for innovation, whether it’s raw ideas or market-ready businesses” (Nambisan & Sawhney, 2007, p. 109). This is often done in the form of crowdsourcing and by posting an innovation challenge. In a recent study on how to best manage crowds in innovation challenges the authors suggest: “When running an innovation challenge, a company posts an open call on the Web to solicit solutions from a diverse range of individuals. […] Achieving the full potential of innovation challenges requires the challenge participants to also integrate their knowledge with the knowledge of others in the crowd” (Malhotra & Majchrzak, 2014, p. 103f).

“To acquire innovations along the external sourcing continuum, companies can engage intermediaries with different characteristics and roles” (Nambisan & Sawhney, 2007, p. 114). To crowdsource the scouting of startups, it is crucial to closely analyze the role of these intermediaries in the open innovation ecosystem. The most critical players of the open innovation ecosystem are, therefore

described in Section 2.3 and their role in scouting and selecting startups is further investigated in the empirical part of this study.

There is a growing number of specialized consultants and platforms helping to scout (and select) startups. A view on innovation management software is provided in Section 2.5 in the theoretical part and an extensive summary of the used and desired software features and functions is given in Section 4.7 in the results section of this thesis. In Table 2-2 only a few platform players who can help scout ideas and/or startups may be introduced:

Table 2-2 Examples of Crowdsourcing OI Platforms

Open Innovation Platform	Homepage	Short Description
INNOCENTIVE	https://www.innocentive.com	Innocentive is an open innovation crowdsourcing company which offers organizations to run "challenges" to let open problems be solved by the crowd, challenges can be run internally (within the organization) or externally, there are more than 400k problem solvers in the network, they get rewards from 20k USD to more than 100k for each winning submission
NineSigma	https://www.ninesigma.com	Nine Sigma is an international technology crowdsourcing and matchmaking platform wich can help find&connect with experts, startups and other partners like academia
enterprise europe network	https://een.ec.europa.eu	ENN is the wold largest support network helping SMEs to innovate and grow internationally. It includes innovation support organizations, regional development organiszations technology pools and others

Selection

Selecting the right innovation projects is one of the most important but also most difficult tasks in innovation management, and rightfully the focus of this thesis. “Failure to make good and timely decisions is bad for efficiency in the short term, and for profit, or even survival in the long term” (Goffin & Mitchell, 2017, p. 249).

There is plenty of literature on how to select projects and quite some specialized literature and experience on how to select a good innovation portfolio. As already stated in the introduction of this thesis, there is a lack of literature and understanding of how the more specific problem of startup selection shall be solved.

With the rising numbers of startups scouted and the ever-higher pressure on companies to excel in open innovation, this is a burning problem. As emphasized by coloring the selection phase in blue in figure 2-2 the central goal of this thesis is to contribute to solving that problem.

Therefore, there is an own section in the theoretical part of this thesis dedicated to selection methods for innovation. In that Section 2.4, the well-documented methodologies for the selection of innovation projects are assessed in terms of their usefulness for the startup selection. Financial and non-financial methods are examined, and possible pitfalls of intuitive decisions are discussed.

The main effort of this thesis, however, was to apply the right methodology and questions to investigate the startup selection in qualitative expert interviews. Questions of the best-suited selection criteria and selection teams are investigated. The results of this exercise are discussed in chapter 4 and most specifically in Section 4.6.

The tool support for the startup selection was also investigated and is discussed in the theoretical part in Section 2.5, and the results of the empirical study concerning the tool support are discussed in Section 4.7.

Implementation

The implementation of innovation and especially of startups projects can happen in the form of proof of concepts (POC) or prototypes which in the best-case quickly lead to marketable products, processes, services or value creation in the form of entirely new business models. The work in short cycles with early feedback allows to "Fail Fast So You Can Fix Early" (Sutherland, 2014, p. 22).

Working with startups often involves co-creation of solutions which fit the specific needs of the corporation and its internal and external customers. Especially when it comes to co-create or implement solutions of digital tech startups, advanced project management methods, and skills are required. Embracing agile SW development methodologies like scrum (Sutherland, 2014) or design thinking (Uebernickel, Brenner, Pukall, & Schindlholzer, 2015) help to talk the same language when dealing with tech-startups in implementation projects.

The recent empirical evidence that only a small percentage of startup contacts with corporates lead to successful implementations (YOUNIS et al., 2017) is tested and discussed in Section 4.6 of this thesis.

People, culture and organization

To make the whole (open-) innovation process, successful **people, culture, and organization** pay a vital role.

S. Ismail gives some guiding principles for highly innovative and highly productive organizations, which he calls exponential organizations (Ismail et al., 2014, p. 85ff). Those organizations focus on interfaces, dashboards, experimentation, autonomy, and social technologies to create much higher and more innovative output than their competitors.

As startups and corporates come from very different cultural and organizational backgrounds, there are some structural hurdles and obstacles to be overcome to ensure good cooperation (Kirsner, 2018) (World Economic Forum, 2018) (Accenture, 2015). How this problem is perceived by practitioners was examined in the empirical part of this study and is described in Section 4.4.

There are also very different ways of how corporates can organize their work with startups. In a recent study, the World Economic Forum elaborated different forms of corporate-startup engagement

dependent on the organization and the autonomy of the innovation program in the company. The study differentiates five models:

“1. A very flat model in which each of the corporate business units directly engage with the start-up.

2. A dedicated innovation unit that operates within the corporate.

3. A separate corporate incubator tasked with attracting promising start-ups whose innovations may later be integrated in the operations of the mother corporate.

4. An external subsidiary to which the mother corporate delegates the task of quick innovative prototyping, based on business ideas vetted as promising at the mother company.

5. An entire process designed to spin off a new entity, of which the mother company will become an investor, for each business idea that is aligned with the general strategy of the mother corporate but could not be effectively be pursued in the mother corporate environment” (World Economic Forum, 2018, p. 14).

To successfully implement open innovation and to benefit from the cooperation with startups leadership and the capabilities of the organization play an important role.

Recent McKinsey research shows that building an organization which supports innovation can be hard and frustrating for managers. The research found that the majority of senior executives have only very little confidence in their innovation decisions (Capozzi, Davidson, & Barsh, 2008, p. 38).

To avoid such a frustration Teece recommends developing what he calls dynamic capabilities opposed to ordinary capabilities in his dynamic capabilities theory (TEECE, 2014). In his definition ordinary capabilities focus on doing things right whereas dynamic capabilities will help managers to do the right things. Dynamic capabilities involve sensing changes in technology and in the business environment, developing innovations and implementing them in a culture which is open to change (TEECE, 2014, p. 4).

Dynamic capabilities “consist of a broad range of activities, including new product development, business model innovation, and alliance formation” (Schoemaker, Heaton, & Teece, 2018, p. 19). Dynamic capabilities rest on three pillars:

- Sensing change – before the competition does so
- Seizing opportunities – by innovating and implementing new systems and
- Transforming the firm – by reshaping the firm and its ecosystems to take full advantage of new business models

In a recent article Teece and his co-authors argue that dynamic capabilities are needed to succeed in a world which has become more volatile, uncertain, complex, and ambiguous (VUCA). They argue that

in a VUCA world leadership must strengthen dynamic capabilities to bring about new products and business models which help to survive in the storm of disruption (Schoemaker et al., 2018). Other authors emphasize the importance of employee empowerment, the creation of learning opportunities and the creation of a climate which fosters creativity to build the necessary dynamic capabilities to succeed in innovation (Fallon-Byrne & Harney, 2017).

As described above, success in open innovation and scouting and selecting the right startups is dependent not only on the internal resources of a corporation but also on the broader innovation ecosystem. As this encompasses a series of players which are new and quickly evolving, they are described in the following chapter.

2.3 Players in the (open-) innovation ecosystem

To make (open) innovation work today corporates need to consider a whole ecosystem of players which shall be chosen consciously, and which ideally seamlessly interoperate. Some of these players, like business angels, accelerators, or crowdsourcing platforms, did hardly exist ten years before this thesis was written and have highly professionalized since. The most important of those players and their current development shall be described as a starting point to discuss their role and contribution to open innovation. These organizations also play an essential role in selecting innovation for corporate players as they preselect startups, which they often actively support in their development.

A comprehensive graphical overview which shows the most important players in this new innovation ecosystem is provided by the design and consulting company XPLANE (XPlane, 2017, p. accessed 4th of November at http://www.xplane.com/innovationecosystem) and reproduced in Figure 2-3.

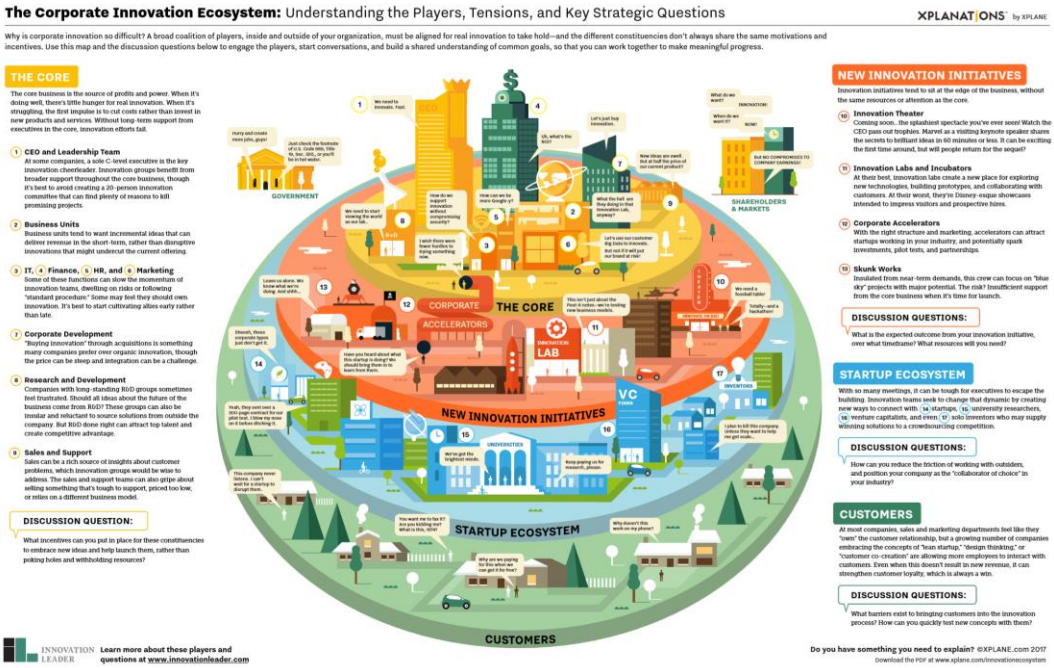


Figure 2-3 Innovation Ecosystem (XPlane, 2017, p. accessed 4th of November at http://www.xplane.com/innovationecosystem)

To describe this universe of specialized players, the term “ecosystem” has been established. “Innovation ecosystems are increasingly regarded as important vehicles to create and capture value from complex value propositions” (Dattée, Alexy, & Autio, 2018, p. 466). M. Sako describes business ecosystems as “a collection of business and other actors with resources operating as an interdependent system. Business ecosystems differ from clusters in sustainability, self-governance, and capacity to evolve over time” (Sako, 2018, p. 21).

In their extensive study of intermediaries that facilitate entrepreneurship P. Clayton, M. Feldman and N. Lowe find five entities most commonly featured in the ecosystem analyses (Clayton, Feldman, & Lowe, 2018, p. 4):

- university technology licensing offices;
- professional service firms;
- workspace providers, including incubators, accelerators, and co-working spaces;
- organizations that provide networking and programmatic assistance;
- financing entities, including venture capital, angel investment, public funding, and crowdsourcing

The most critical trend seems to be the rising number of startups and the rising popularity of accelerators, incubators, and corporate venture capital. A recent study of BCG together with Hello Tomorrow indicates that startups have a significant contribution “Especially within the field of radical innovation” (De la Tour, Soussan, Harlé, Chevalier, & Duportet, 2017, p. 10)

“The most notable rising trend, however, is the growing role of startups and their increasingly important collaborations with corporates” (De la Tour et al., 2017, p. 9)

BCG´s report “Corporate Venturing Shifts Gears” stated that the percentage of companies using CVC increased from 27% in 2010 to 40% in 2015 and the use of accelerators and incubators increased from 2% to 44% in the same time as shown in Figure 2-4 (Brigi, Hong, Roos, Schmieg, & Wu, 2016, pp. 6, Exhibit 2)

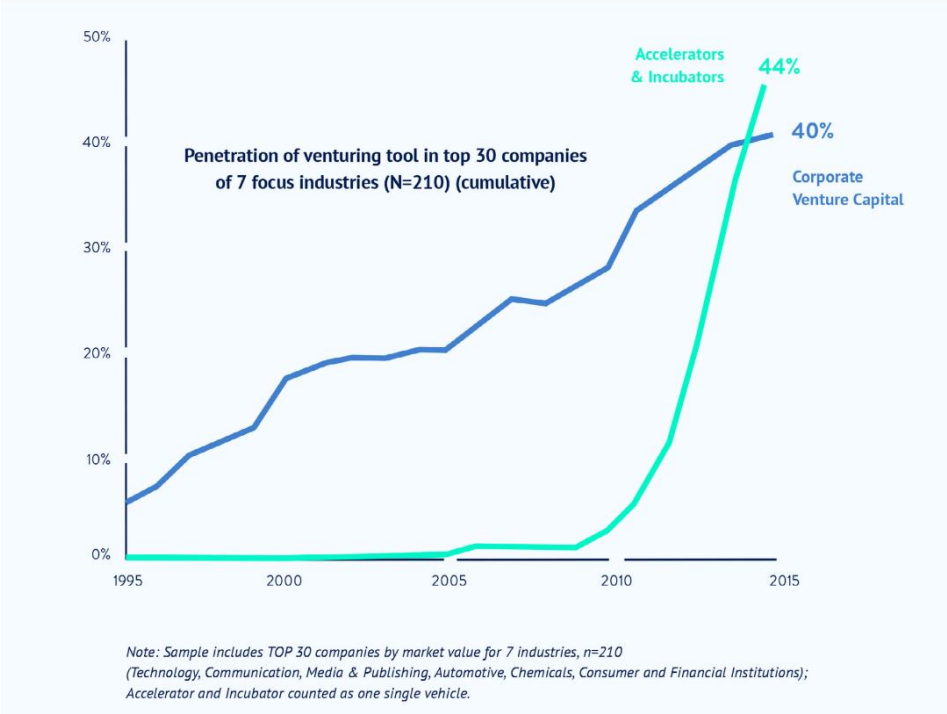


Figure 2-4 Use of CVC, Incubators, and Accelerators (Brigi et al., 2016, pp. 6, Exhibit 2)

In the following chapters, some of the most important players who are also instrumental in scouting and selecting startups will be described.

2.3.1 Incubators and Accelerators

Incubators are programs which aim to get the entrepreneurs from an early ideation stage to launch their new product.

"Incubators, as the name implies, attempt to support early-stage firms to a point where they hatch, or become viable entities." (Clayton et al., 2018, p. 109)

The first generation incubators can be dated back to the late 1950s offering mainly affordable working space to later generation incubators, which also offer a wide range of services including knowledge and network support. (Clayton et al., 2018, p. 109)

Some examples are:

- Cambridge Innovation Center (https://cic.com/)
- TechColumbus (https://www.rev1ventures.com/entrepreneurs/rev1labs/)
- MaRS Discovery District (https://marsdd.com/)

Accelerators, however, are a much more recent form of startup support. Although "in practice, the terms incubator and accelerator are often used interchangeably" (Isabelle & Drucker, 2013, p. 18) "they differ from incubators on a number of variables, including duration, business model, selection, and mentorship" (Clayton et al., 2018, p. 110). D. Isabelle and P. Ducker distinguish incubators and

accelerators mainly on the criteria of profit orientation (see Table 2-3). They describe incubators as typically not-for-profit organizations keen on economic development in an area. In contrast, accelerators are for-profit organizations that focus on a fast return on investment.

Table 2-3 Distinctions between Incubators and Accelerators (Isabelle & Drucker, 2013, p. 19 Table 1)

Incubator	Accelerator
For early-stage startups	For next stage, for high-growth firms
Long-term process	Short-term process
Sectors with longer time to market	Sectors with shorter time to market
An institution	A program within an institution
Building sustainable firms	Short-term horizon, cohort-based
More focused on economic development	More focused on growth and ROI
Generally not-for-profit	Generally for-profit
Older establishments	Newer establishments or programs

Accelerators usually provide startups with technological, organizational, legal, and fund-raising advice and help with some initial funding. The numbers for initial funding may vary but are usually in the range of 10.000 USD to 50.000 USD. In return, they normally get a small part of equity. Here the numbers also vary significantly but mostly vary between 4% and 10% (ANDRUSS, 2013, p. 80)(Small Business Institute Directors' Association (U.S.) & Hoffman, 2012, p. 60ff).

Some well-established examples of accelerators are:

- Y-Combinator (https://www.ycombinator.com/) who are proud to have supported successful companies like Dropbox or Airbnb
- TechStars (https://www.techstars.com/) who also founded Global Accelerator Network a network of over 90 accelerators around the world (https://www.gan.co/)
- DeamItVentures (http://www.dreamit.com/)
- AngelPad (https://angelpad.org/)

A crucial function of accelerators and incubators is to offer workspace where startups can easily work and co-create with other members of the ecosystem. The function of so-called Co-working spaces is however, also offed by separate local and regional organizations around the globe.

2.3.2 Financing entities

The next group of players in the open-innovation ecosystem that developed exponentially in the last years are the Financing entities. Today startups have a wide choice of highly professional organizations to turn to for financing their new products and services. Equity financing can not only come from accelerators as described in Section 2.3.1 but also from venture capitalists (VCs), corporate venture capitalists (CVCs), angel investors, crowdfunding (Drover et al., 2017, p. 3) and increasingly from Family Offices who seek to enter this field much earlier than previously and invest directly. All these players in the open innovation ecosystem are relevant for the startup selection process as they scout and (pre-)select startups as part of their daily business.

Venture Capital (VC) traditionally plays a vital role in financing startups and has dynamically developed in the last years. VCs normally take the high risk to invest an equity stake in startups which have a large growth phantasy (Bottazzi & Rin, 2002, p. 235). Due to the high risk and the information asymmetry VCs often involve closely in the startups decision making and practice a close monitoring of the founders and managers (Wright & Robbie, 1998, p. 525). VCs usually pay out in tranches, which allows them to stop funding when predefined benchmarks are not met.

VCs often have thousands of new ventures applying for funding each year, so startup selection is their daily challenge. Despite this practical relevance there is almost no literature about the VC selection process (Knockaert et al., 2010, p. 357).

In one of the rare analysis of the investment decisions undertaken in 68 European early-stage high-tech VC-investors, the authors found three clusters of VC-investors dependent on their main decision criteria: “Technology investors attach more importance to the appropriability of the technology and contact with the entrepreneur than the other groups of VCs. For people investors, the human factors such as leadership capacities of the entrepreneur and the quality of the team are most important. Financial investors make their investment decision based on a limited set of factors such as ROI, growth and team completeness” (Knockaert et al., 2010, p. 357).

In another study of 64 ventures, the authors filtered out which non-founder related selection-criteria could help VCs filter out high-flyer investments which paid back a minimum of five times the VC´s first-round money invested (Streletzki & Schulte, 2013). According to their study ventures the with the following characteristics had the best chance to become high-flyers: ventures working in the B2C market, ventures being situated in a urban cluster and close to the lead investor and raising VC money prior to the POC and ventures using strategic partners raising the first round of investment (Streletzki & Schulte, 2013, p. 29).

One can talk about **corporate venture capital** when there are equity investments in new ventures done by incumbent firms and not by classical VCs or other financial institutions. The benefits of the companies are that they can directly benefit from co-created projects and to get more exposure to

new startup ideas. They also benefit from gaining experience in evaluating and assessing new technologies (Benson & Ziedonis, 2009, p. 333). Like VSs, also CVCs must solve the startup selection problem. “The effectiveness of the matchmaking process is crucial for the strategic success of CVC programs” (Napp & Minshall, 2011, p. 33).

Business angels are wealthy individuals who invest their money and time into early stage startups. Oftentimes they provide legal and organizational support along with industry expertise (Bottazzi & Rin, 2002, p. 235). One of the main differences to VCs is that business angels:” typically invest at an earlier stage of growth and provide more business guidance than venture capital providers” (Rostamzadeh, Ismail, & Zavadskas, 2014, p. 696). Frequently former top managers or successful serial entrepreneurs who have much experience in the startup business become business angels later in their career. Business angels usually invest smaller amounts of money in very early stage startups risking their entire investment. A recent study found that under these conditions of extreme uncertainty business angels use their “gut feel” and ”rely on a combination of expertise-based intuition and formal analysis in which intuition trumps analysis” (Huang & Pearce, 2015, p. 634). Section 2.4.1 gives a critical perspective on intuitive decisions in the light of recent findings of cognitive science, psychology, and behavioral economics.

Crowdfunding is the latest and maybe least understood form of financing startups (Clayton et al., 2018, p. 116). It can be used to get funding from many individuals normally via the Internet. The investors get a reward often in form of future products or equity (Mollick, 2014, p. 1). A similar from of finance is crowd lending where a peer-to-peer loan is granted. Crowdfunding might have a large potential to change and to democratize the investment market as it enables startups to bypass financial intermediaries and experts and to gain funding directly from the crowd. Therefore, startup selection processes might differ significantly in case of crowdsourcing compared to funding via VCs, angels, or corporates. Yet, “there is very limited research on factors that influence the crowd’s investment decisions” (Kim & Viswanathan, 2019, p. 348). The findings of one early study on that topic “suggest that the signals of quality that are used by VCs to assess the viability of new ventures are also used by crowdfunders” (Mollick & Robb, 2016, p. 75). The criteria looked at have been team pedigree, outside endorsements, and extensive preparation.

Examples of popular crowdfunding platforms are:

- Kickstarter https://www.kickstarter.com/
- Indiegogo https://www.indiegogo.com/
- Patreon https://www.patreon.com/

Crowdfunding must be distinguished from crowdsourcing platforms for scouting startups as described in Section 2.2.2 of this thesis.

Of course, there are also other traditional funding sources for startups like friends and family, public funding, or also bank money which are not discussed here in more detail.

The role of other well-known entities in the innovation ecosystem like universities, startup events, or professional service and consulting firms in the scouting and selection process is further investigated in the empirical part of this study.

After having defined the terms and having discussed the frameworks of innovation and the players involved in the selection of startups, the Section 2.4 will present methodologies to select a portfolio of startups.

2.4 Theory on Selection Methodology for Innovation

The previous sections in the theory part of this thesis have shown how the startup selection process:

- relates to innovation and open innovation
- is embedded and influenced by the other elements of the open innovation framework and the innovation pentathlon framework
- is relevant to most of the players in the innovation ecosystem.

The negative implications of wrong or ill-judged selection decisions are widely recognized (Goffin & Mitchell, 2017, p. 213)(Cooper, Edgett, & Kleinschmidt, 2001, p. 362f). Among others, the following negative implications are referred to:

- Lack of strategic fit – possibly many strategically unimportant projects are in the portfolio
- Low-value projects are selected and driven forward. Money is wasted because these projects get not killed early enough. Therefore, there is a lack of resources for more valuable projects, which leads to weak overall profitability.
- No focus, and therefore, too many projects
- Unadventurous, low-impact projects dominate.
- Slow decision-making due to lack of methodology and process - thus, losing out on attractive opportunities and lost profits

Despite those negative implications, there is a gap in literature and a lack of studies and theory on the topic of startup selection which is widely acknowledged and bemoaned by scientists and practitioners (Goffin & Mitchell, 2017, p. 62)(West & Bogers, 2014, p. 820) (Cui et al., 2012, p. 29)(Kim & Viswanathan, 2019, p. 348)(Huang & Pearce, 2015, p. 634)(Knockaert et al., 2010, p. 357).

In that situation, practitioners might even fall back to very intuitive approaches (Huang & Pearce, 2015, p. 634). The next Section 2.4.1 will warn against relying blindly on intuition based on the findings of modern psychology and behavioral economics.

Although there are only very few specific studies on the startup selection, a lot can be learned by studying the more abundant literature on the more general topic of selecting (innovation-)projects and creating innovation portfolios. In the Sections 2.4.2, 2.4.3 and 2.4.4, these more general selection methodologies shall be introduced, and their utility for the startup selection process shall be discussed. This leads to the last Section 2.5 of the theory section, which deals with the available tool support for innovation management and startups selection.

2.4.1 The Disadvantage of Intuitive Judgement

It is often argued that the top performers in innovation management rely on their superior intuition in the selection process. Some authors claim that "Selection decisions for innovation projects always involve intuitive judgements" (Goffin & Mitchell, 2017, p. 249).

Although intuition might support good decisions - especially when quick decisions are needed in unstable environments (Huang & Pearce, 2015, p. 337f) - there are also severe downsides. Cognitive science, psychology, and behavioral economics give many well-proven examples that intuitive decisions can lead to systematic and significant errors.

Some of these errors or cognitive biases, which can be relevant for startup selection decisions shall be described in this chapter to emphasize the importance of analytical methodologies and the potential of digital support in this process.

The **halo effect** – also called "*what is beautiful is good*" principle – describes an inherent tendency of rating attractive individuals more favorably in other unrelated personality traits. This can also more generally apply for opinions of high-status people getting more weight in startup selection decisions even though they have no superior knowledge about the subject.

The **law of small numbers** says that humans, in general, are prone to overestimate the reliability of experiences based on small samples. This might cause to trust in our own experiences even when they are based on a minimal number of cases (Kahneman, 2011, p. 110). So sometimes successful serial entrepreneurs get funding easy although their new idea might have high risk just because the investors were happy with previous investments into their startups.

The **anchoring effect** "occurs when people consider a particular value for an unknown quantity before estimating that quantity. […] the estimates stay close to the number that people considered – hence the image of an anchor" (Kahneman, 2011, p. 119). An example when it comes to select startups is the

effect of first valuations called by the entrepreneurs or early investors. In case these numbers are very high, according to the theory, later investors will be influenced by that and bid higher.

Groupthink "occurs when the dynamics of the group itself are driving the decision-making. It might be because it is excluding external voices, or not listening to those who are being critical, or because the group's homogeneity is resulting in similar positions being taken on issues" (Brewer, 2017, p. 52). This can lead to overlooking any counter arguments in decision meetings when no body dares to counter the group opinion.

Availability bias is the: "Tendency to overestimate the likelihood of events with greater "availability" in memory, which can be influenced by how recent the memories are or how unusual or emotionally charged they may be" (Ismail et al., 2014, p. 71).

Sunk costs aversion occurs when a person has paid or invested into something and feels bad about writing it off and move on even when there is no more benefit or utility to be expected from that transaction anymore. This can prevent managers from stopping startup projects even when it becomes clear that they would fail because they feel an irrational pain to write off the costs already accrued (Lewis, 2015, p. 64).

Loss aversion is the tendency to feel losses of the same amount more painful than equal gains. It might lead to risk-averse decisions which hinder innovation.

Status Quo bias is a tendency to prefer to keep the status quo if there is no pressure to change it.

Some of these biases like the loss aversion the sunk cost and the status quo bias might be summarized as stability biases and "create a tendency toward inertia in the presence of uncertainty" (Lovallo & Siboney, 2010, p. 16). Studies show that "Risk-averse midlevel managers making routine investment decisions can shift an entire company's risk profile" (Koller, Lovallo, & Williams, 2012, p. 1).

Most decisions in innovation management and especially decisions to cooperate with or to acquire startups are made under high uncertainty meaning "that the decision maker (i) knows what her alternatives are and what outcomes they may result in, but (ii) is unable to assign any probabilities to the states corresponding to the outcomes" (Peterson, 2017, p. 41). This suggests that companies must apply strategies to fight inertia and embrace risk-taking to progress in innovation. Especially as recent studies support the assumption that successful innovation needs a higher degree of risk-taking as: "High-performing companies are 2x as likely to report being risk-seeking when pursuing innovation" (CBinsights, 2018, p. 17).

Directly fighting these and many other biases might be hard as J. Sutherland puts it: "[…) this isn´t a failure of will; this is the nature of people. Fighting it head-on is silly - it´s like fighting gravity" (Sutherland, 2014, p. 127). Even well-trained experts are not immune. "Experts show many of the same biases as the rest of us in attenuated from […]" (Kahneman, 2011, p. 140).

Nevertheless, smart processes and technology can help a lot to reduce irrational human selection behavior. J. Sutherland gives an excellent example in applying a Delphi methodology in which experts get the anonymized results of the group members instead of discussing face to face to fight halo effects and group thinking (Sutherland, 2014, p. 127f).

S. Ismail is also aware of the pitfalls of management decisions when pointing out that:"[…] most companies today are still driven almost solely on the intuitive guesses of their leaders" (Ismail et al., 2014, p. 71). He sees the solution in using data and AI to overcome biases when claiming:"[…]almost all the business insights and decisions of tomorrow will be data-driven" (Ismail et al., 2014, p. 71).

2.4.2 Portfolio Theory

As most companies pursue a series of innovation options or projects simultaneously, the question of selecting and investing in the right portfolio is vital.

"Portfolio management for product innovation - picking the right set of development projects - is critical to new product success" (Cooper et al., 2001, p. 361). "Project portfolio management is one of the main axes of management models of public and private organizations involved in research, development and innovation (RD&I) activities" (Bin, Azevedo, Duarte, Salles-Filho, & Massaguer, 2015, p. 613).

The selection process is not only about deciding whether a single project is intrinsically worth making but also to choose the right portfolio of projects to meet the company's strategic goals and to distribute risk to different categories of projects.

For instance, a balance of the long term and short-term, or a balance of more risky breakthrough projects and less risky but also likely less rewarding incremental projects might be desirable. Goffin and Mitchel warn that without a clear strategy and selection process "Many companies get caught in the so-called incremental trap – only selecting projects that match their core business and are at low risk." (Goffin & Mitchell, 2017, p. 211) This focus on smaller incremental innovation is also what KPMG found in its latest survey of 270 executives responsible for innovation, R&D, and strategy. Almost half of the innovation efforts seem to be spent on incremental near-term work whereas only 23% of the efforts are spent on transformational innovation meaning products and services the company does not yet offer or that affects its business model (Farell et al., 2018, p. 18).

R. Cooper, S. Edgett and E. Kleinschmidt give a good definition of portfolio management as "… a dynamic decision process, whereby a business's list of active new product (and R&D) projects is constantly updated and revised. In this process, new projects are evaluated, selected and prioritized; existing projects may be accelerated, killed or de-prioritized; and resources are allocated and re-

allocated to the active projects." in their study of 30 leading North-American firms on the topic of portfolio management for new project management. (Cooper et al., 2001, p. 361)

As shown in figure 2-5, the authors asked how popular each portfolio management method is. As most companies use a series of methods in parallel, they also asked which method dominates the decision.

As shown in the figure 2-5, financial methods were not only most widely used (77,3%) they also dominated the decision process (40,4%) in the participant firms. In contrast, scoring models were used by only 37,9% of the firms and contributed only 5,3% to the decisions taken. (Cooper et al., 2001, p. 365)

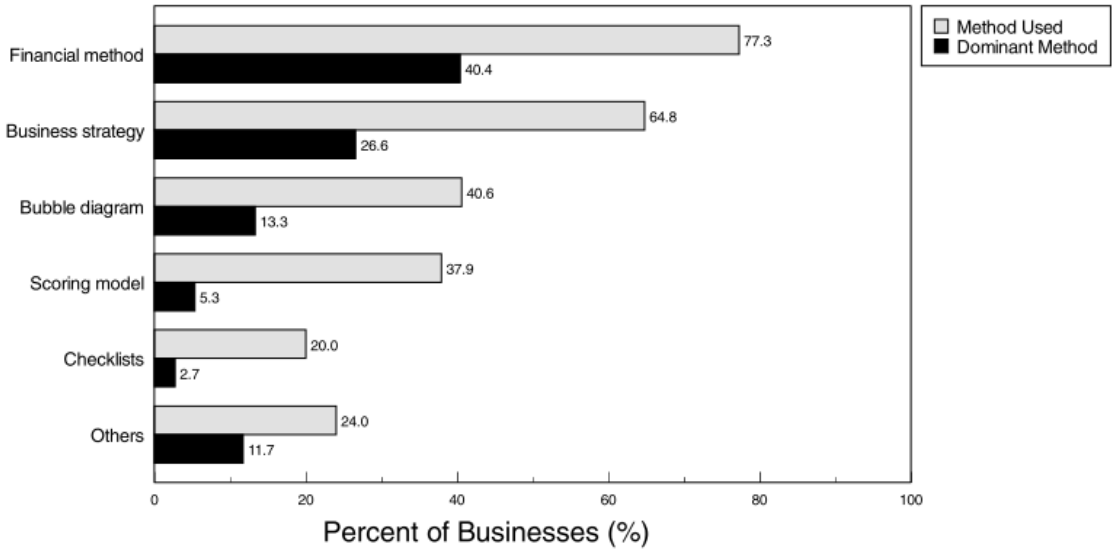


Figure 2-5 Usage and Dominance of Selection Methods (Cooper et al., 2001, p. 365)

The study also investigated which method yielded the best results, as depicted in Figure 2-6. The striking finding was that the best portfolio decisions measured on a series of criteria like alignment with business objectives, the inclusion of high-value projects, strategy alignment, finalization in time, balance and number of projects turned out to be the ones rarely used or not dominant. "The Best tend to rely much less on financial models and methods as the dominant portfolio tool than does the average business. By contrast, the Worst place much more emphasis on financial tools." (Cooper et al., 2001, p. 374). This can be seen in Figure 2-6. (Cooper et al., 2001, p. 376)

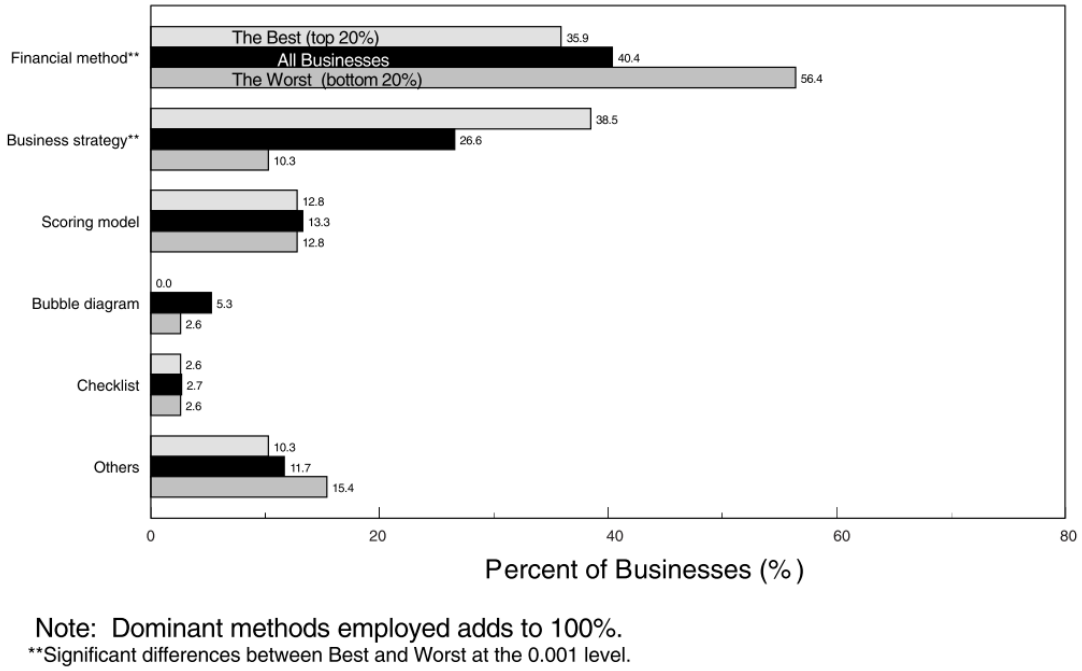


Figure 2-6 Quality of Decision per Selection Method. (Cooper et al., 2001, p. 376)

Furthermore, the best decisions seemed to have occurred when:

- They have established an explicit method
- Management buys into the method
- There were clear rules and procedures
- Multiple methods were applied: "The Best tend to rely on multiple methods for portfolio management - that is, they appear to acknowledge that no one method gives the correct results." (Cooper et al., 2001, p. 376)

Other authors indicate that the "right" methodology might depend on the stage or maturity of the innovation project. "Different selection tools are needed at different stages along the funnel" (Goffin & Mitchell, 2017, p. 214). They suggest that early stage (often more radical) innovations can only be selected by intuition or multi-criteria analyses whereas more mature projects shall be scrutinized more financially.

Hurdles for the usage and the establishment of universal selection tools might be

- that every decision is very special, and no single solution can capture all the particularities and
- the complexity of such approaches which make it hard for decision-makers to master and apply them. (Bin et al., 2015, p. 614)

Especially in the fast-moving world of startups, the selection needs to be made quick and must not be too complicated for users to be embraced. The challenge with often highly mathematical optimization methods in the field of selection of innovation portfolios or projects seems to be "[…] that additional efforts are still needed in this field, predominantly to deal with complexity in a less complex way" (Bin

et al., 2015, p. 614) and that for startups many of the input variables for financial models like stable revenue streams simply do not exist.

2.4.3 Financial Assessment Methods

As discussed above financial assessment methods are widely used but seem to be more useful when it comes to more advanced stages in the selection process or in cases when the technology or the maturity of a partnering company or startup is more advanced.

Especially when the new technology also requires a business model shift financial methods seem not appropriate (Evans & Johnson, 2013, p. 52).

In early stage startups, there might only be a vague product idea and not even a prototype available. Therefore, future pricing, revenue streams, or costs are hard to estimate. Help to evaluate the maturity of technology are technology readiness levels (TRLs) offered by the American Department of Defense or NASA. (Office, 2016) as shown in Table 2-4.

Table 2-4 Technology Readiness (Office, 2016, p. 17)

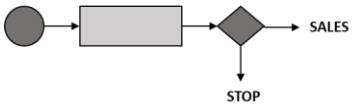
Technology readiness level (TRL)	Description
1 Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples include paper studies of a technology's basic properties.
2 Technology concept and/or application formulated	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3 Analytical and experimental critical function and/or characteristic proof of concept	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate the analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4 Component and/or breadboard validation in laboratory environment	Basic technological components are integrated to establish that they will work together. This is relatively low fidelity compared with the eventual system. Examples include integration of ad hoc hardware in the laboratory.
5 Component and/or breadboard validation in relevant environment	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so they can be tested in a simulated environment. Examples include high fidelity laboratory integration of components.
6 System/subsystem model or prototype demonstration in a relevant environment	Representative model or prototype system, which is well beyond that of TRL 5, is tested in its relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment.
7 System prototype demonstration in an operational environment	Prototype near or at planned operational system. Represents a major step up from TRL 6 by requirement demonstration of an actual system prototype in an operational environment (e.g., in an aircraft, a vehicle, or space).
8 Actual system completed and qualified through test and demonstration	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9 Actual system proven through successful mission operations	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Making the financial projections more and more elaborate does not make the results more accurate. When it comes to more advanced technologies or projects; however, financial assessment methods are the tool of choice.

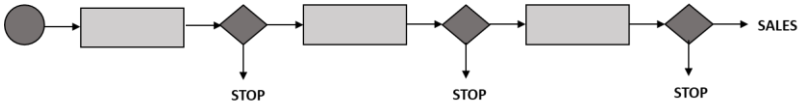
It is useful to think of at least three types of projects when applying selection methods. These methods are described in Figure 2-7.

Figure 2-7 Single-stage, Multi-Stage and Network projects (Goffin & Mitchell, 2017, p. 215)

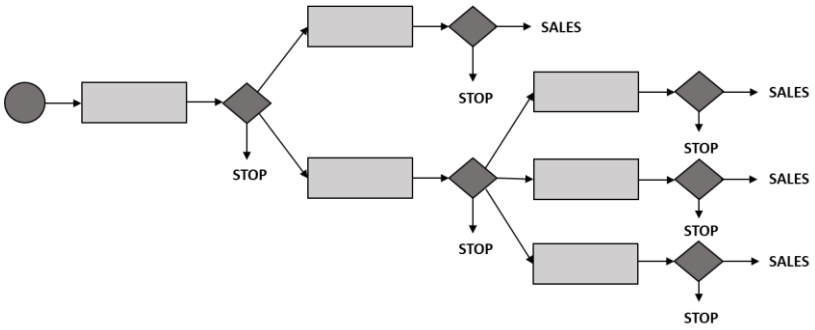
1) Single-stage projects which are executed from start to finish without interruption (boxes are activities, diamonds represent decision points)



2) Multi-stage projects where reviews are conducted after some while and decisions to stop or continue are taken on the way. This is often applied for larger or more radical change projects.



3) Network projects include more types of decisions than only stop/go decisions resulting in so-called "*Decision Trees*".



For **single stage projects,** the following methods can be used:

Calculating Value

The easiest way to estimate the value (V) of a project is to simply estimate the income (I) which it generates and subtract the costs (C) which results in net value.

$V = I - C$

As a simplification, this method can also be applied in early-stage projects. It is beneficial to try to estimate incomes and costs in a hypothetical future when the product will be fully developed, and the project is up and running. As an example, Lockheed Martin favor a similar approach in their evaluation of thousands of internal and external ideas in their Innovate the Future Program. They argue that this very easy to use method is preferable to the more sophisticated Net Present Value approach because uncertainty will only create the illusion of accuracy when they say: "However, in our experience, the uncertainty due to the timing of cash flows is not the major driver of overall uncertainty and can be safely ignored at the earliest stages of innovation" (Evans & Johnson, 2013, p. 53).

Payback Method or Time to Break Even

Payback time or time to break even (TBE) measures the time it takes for the cash flow from the project to return the original investment. "[…] it tells you how long it will take to get your money back"(Berman & Knight, 2006, p. 187).

"Other thing being equal, a project with a short TBE is more secure than one that takes longer, simply because there is less time for unexpected things to happen" (Goffin & Mitchell, 2017, p. 217).

Disadvantages of this method are that it does not consider the cash flow beyond breakeven, does not give an overall return and does not take the time value of money into account. Therefore the method shall only be used to compare projects not to reject them (Berman & Knight, 2006, p. 188).

Net Present Value

Having mentioned the limitations of accuracy due to the high uncertainty of innovation projects there is still a point in taking the time-related value of money into account. This can be achieved by discounted cash flow (DCF) calculations and gives good results as soon as there are sound estimations on the timing of future incomes and costs and a robust business plan. When future costs and incomes are both discounted, the result is called net present value (NPV). Net Present Value is "[…] usually the finance professional´s first choice for analyzing capital expenditures" (Berman & Knight, 2006, p. 188).

A standard formula for NPV can be described as follows (T are the cashflows – costs and incomes each year, and i is the yearly cost of money):

$$NPV = T_1 + T_2/(1 + i) + T_3/(1+i)^2 + T_4/(1+i)^3 + \ldots$$

The discount rate i is the average cost of capital, which includes the cost of equity and debt.

So NPV is recommendable to use, especially when the timescales of a project are long, or the money costs are high. In the context of innovation and startup selection beside the uncertainty of costs and incomes, there are some further limitations and pitfalls (Goffin & Mitchell, 2017, p. 216).

1) Discount rates are often only based on "*gut feel*" and unsatisfyingly increased to include the higher risk of innovation projects
2) Uncertainty is regularly seen as a negative factor – neglecting that the outcomes of innovation can also deviate in a positive direction from the estimates
3) Including risk in a financial discount number can hide it and hinder it from being managed accordingly

Internal Rate of Return (IRR)

The IRR is the discount factor (i in the previous NPV example) which makes the NPV equal to zero. A project with a higher IRR would be preferred to a project with a lower IRR. The method has the same limitations concerning the innovation specific uncertainties of the input variables but only gives a percentage and not the dollar size of the return and does not tell how long the company expects to enjoy the given rate or return.

IRR is therefore often used as an additional method to NPV (Berman & Knight, 2006, p. 192). Furthermore, "Companies often reject projects that do not meet a threshold value for TBE or IIR (Goffin & Mitchell, 2017, p. 217).

No matter which of the methods described before it is always recommendable to do some sensitivity analyses to figure out what impacts changing the input variables have on the result.

For **multistage and network projects,** the following more sophisticated methods are discussed in the literature.

In multistage innovation projects, there is the possibility for the management to intervene and stop or alter the project if necessary. This can significantly de-risk the project and increase its overall potential value. "Cleary, neglecting the possibilities for choice and action during a project can lead to serious undervaluation and the likely rejection of potentially excellent opportunities" (Goffin & Mitchell, 2017, p. 220).

The methodology helping managers to estimate the value of multi sage projects is called **decision tree analyses (DTA)**. In DTA, the probability of success in the various steps of the project is estimated. The estimated overall value of such a project is known as the expected commercial value (ECV). Decision trees "also use graphical models to display several relevant aspects of a decision situation. These graphical models consist of treelike structures (hence the name) with branches to represent the possible action-event combinations" (Dey, 2002, p. 17). ECV gives a single value as a result.

The calculations can be made even more realistic by replacing single values for costs for each step in the project by a range of possibilities. In this case, a **Monte Carlo simulation** is needed to calculate all the possible outcomes of the management decisions made. In the Monte Carlo simulation, a random number generator is used to simulate all possible outcomes in the decision tree.

The maybe most sophisticated way to evaluate innovation projects is applying methodologies developed to analyze financial instruments. The so-called '**Real Options' method** draws on the analogy of options as a financial instrument and innovation projects where managers have the option but no obligation to proceed with a project after each step. "The Real Options approach is especially tailored to deal with *uncertainty* and *flexibility* related to an investment project […] and there is substantial evidence that R&D and innovation management are key areas for the application of the approach" (Perlitz & Peske, 1999, p. 256). The Real Options method has some potential to also serve open innovation projects as startups are often invited to do a prototype, and the company has the "right but not the obligation to continue with the project once the first phase was terminated" (Schneider et al., 2008, p. 86).

All the methodologies coming from risk management suffer from at least two significant limitations. When it comes to evaluating project risk they: "require detailed quantitative information, which is not normally available at the time of planning, and the applicability of such models to real project risk analysis is limited, because agencies participating in the project have a problem with making precise decisions" (Dey, 2002, p. 15).

2.4.4 Non-Financial Assessment Methods

As it is discussed in the previous section there are several well elaborated financial models available to assist the selection of innovation. Most of them, however, have severe limitations when it comes to select more radical early stage projects which are regularly in focus when organizations want to select startups.

In startups, there is much uncertainty about what can be achieved and how potential customers will react. Although high-level business plans often exist, financial information is often incomplete and unreliable. Moreover "Overly elaborate models, and especially those whose workings are hidden in complex mathematics, obscure the assumptions and can perhaps confer a spurious authority" (Goffin & Mitchell, 2017, p. 228).

This leads to the development and application of non-financial assessment methods which take many criteria into account and can be used by teams of evaluators or curators to get a broader sample of estimations and balance them against each other. These methodologies are called **multi-criteria analyses** or simple **scoring**. As shown in Section 2.4.2, scoring tools are very popular and effective (Cooper et al., 2001). One of the assumptions tested in the empirical part of this master thesis is, that scoring tools have a predominant role when it comes to startup selection.

Some of the main benefits of scoring tools are that they can take multiple factors into account, which can be balanced and weighted against each other. Financial criteria can be included. The criteria can

also be tailored to the specific maturity stage, the data available, or the aims of the selection project. The assumption is that the scoring methodology can very well fit the startup selection problem.

"The published literature on how to go about designing a scoring tool is surprisingly sparse and there are no published examples that can be regarded unequivocally as best practice" (Goffin & Mitchell, 2017, p. 229).

Some of the important questions when designing a scoring tool are:

- How shall it be structured?
- Which criteria or factors shall it have and how many?
- How shall the criteria be weighted?

The **structure** of a scoring tool for startup selection can be built around the two main dimensions of opportunity and feasibility of success.

Regarding the **factors and criteria** to be used, there are only very few hints in literature. In this section, the rare studies providing insight into this topic shall be quoted.

In their study of over 200 larger North American firms R. Cooper, S. Edgett, E. Kleinschmidt provide one of the scarce answers on which criteria are used to select innovation projects (Cooper et al., 2001). Their results might give some indication on which criteria could also be useful for the more specific question on how to select startups.

Regarding the use of scoring tools, in general, they found: "Scoring models, when used, tend to be employed overwhelmingly as a ranking or prioritization tool: that is, the project score is used to rank order projects against each other. Relatively few businesses, by contrast, use scoring models to make Go-Kill decisions per se (that is, where the score is compared to some cut-off criterion or hurdle)." (Cooper et al., 2001, p. 371)

The authors found the criteria shown in figure 2-8 as most often used to rank innovation projects in general (Cooper et al., 2001, p. 372).

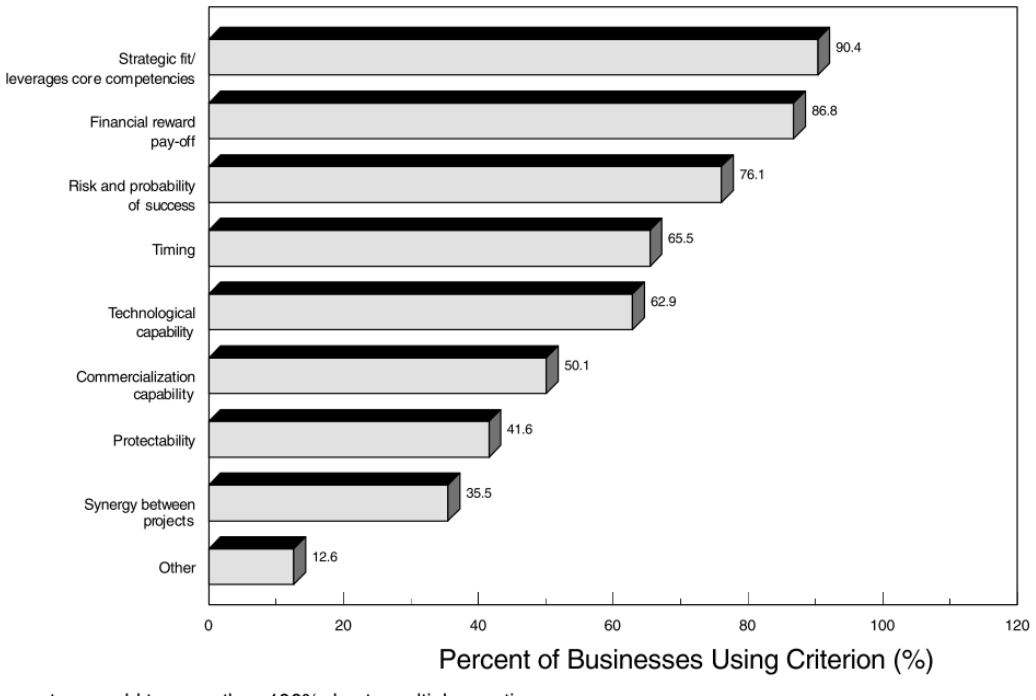


Figure 2-8 Criteria to rank Innovation Projects (Cooper et al., 2001, p. 372)

Interestingly strategic fit and financial reward or pay-off were named most often.

Similar criteria seem to apply for the selection of startups into acceleration programs. In an exploratory study of five leading accelerator companies, D. Hoffman and N. Radojevich-Kelley found that the most important criteria to select candidates for the boot-camp was the accelerators ability to make a difference to the startup which corresponds somewhat to the strategic fit mentioned in studies with corporates selecting startups. “According to accelerator founders, the single most important criteria used for selecting candidates for their boot-camp programs is the accelerator company’s ability to make a difference to the start-up […] In addition, half of the participants in the study reported that start-ups must have strong lead founders, a willingness to adapt their business concepts if necessary, and a business concept that solves a real-world problem in a creative way. A working prototype and stellar technical expertise were viewed as important, but not vital when selecting candidates for the boot-camps.” (Small Business Institute Directors’ Association (U.S.) & Hoffman, 2012, p. 63) table 2-5 shows that the accelerators in the study did rank very different criteria as most important for their selection.

Table 2-5 Selection Criteria of Accelerators for Startups (Small Business Institute Directors' Association (U.S.) & Hoffman, 2012, p. 63 Table 4)

Accelerator	Most Important Criteria for Selecting Candidates
LaunchBox Digital Capital Factory	Strong Lead Founder
TechStars	Tech Expertise
LaunchBox Digital Capital Factory TechStars	Accelerator's Ability to Add Value to Incoming Start-Up
TechStars	Working Prototype
Capital Factory	Incoming Team's Willingness to Listen & Adapt
LaunchBox Digital TechStars	Idea Solves a Real Problem

Neither screening process nor selection criteria seem to be universal as "each accelerator company has its own unique screening process and selection criteria." (Small Business Institute Directors' Association (U.S.) & Hoffman, 2012, p. 64)

Another explorative study which tries to shed some light on the selection issue in open innovation was looking into 31 innovation outsourcing projects at Siemens (Cui et al., 2012). Cui et al. worked on provider selection criteria and project management success drivers. The authors are fully aware of the central importance of the selection problem as a starting point for all further R&D outsourcing decisions when they claim that "Before the outsourcing of R&D can begin, the question of how to select a technology provider must be resolved by management" (Cui et al., 2012, p. 30).

Although they did not find a universal checklist, they identified some drivers which seemed "to be contingent on the type of vendor chosen and on the maturity of the technology" (Cui et al., 2012, p. 29). Whereas some drivers were common to all types of providers, some only referred to one or some of the five provider types (startup companies, universities, competitors, customers, and component suppliers) investigated.

The following universal success drivers, which can be used as universal selection criteria were identified:

- "trust and communication
- organizational stability,
- defined goals,
- and incentive alignment" (Cui et al., 2012, pp. 29–30)

The analyses found that a match between the innovation outsourcer's motivation and the provider's (startup, university, customer, competitor, component provider) strength is a necessary but not sufficient condition for the success of outsourcing. "In other words, without a match the project is at a high risk of failure, but even with a match other things can go wrong" (Cui et al., 2012, p. 36).

Generally, they see the list shown in Table 2-6 of possible motivations for innovation outsourcing.

Table 2-6 Motivation for Innovation Outsourcing (Cui et al., 2012, p. 31)

Motivation	Advantages
Cost	Reduce investment by R&D cost and risk sharing
	Partner's low development cost (better process, cheap labor, competitive pressure in provider market, larger scale, etc.)
	Has become less dominant a motivation over the last decade (Ro et al. 2008)
Market	Understand current market needs
	Gain access to potential new market
	Get help with "new to the market" innovations
Manufacturing	Gain access to components that shorten time-to-market cycle
	Obtain lower manufacturing cost or total cost of ownership
Technology	A trend to increasing technology complexity prevents mastering all relevant technologies
	Technology monitoring and access to technology and general expertise, especially close to industry frontier
	Identify and influence potentially disruptive technologies
Strategic	Focus in-house expertise, outsource non-core competences
	Respond to regulations, standards, or changing market structure
Organizational	Avoid internal rigidities and barriers when facing new markets with different requirements
	Outsourced components as benchmarks may encourage organizational change and innovation

In their view the motivations for innovation outsourcing may differ with the maturity of the technology. Whereas for embryonic technologies, a need to understand market demands, explore better solutions, build expertise, and identify potentially disruptive technologies are essential for mature technologies cost, manufacturing, and strategy might be dominant. This view is also supported by T. Weigl and K. Goffin in a study conducted at the Swedish health care company Mölnlycke, which found that different selection methods proved useful depending on the degree of innovation. For incremental innovations project selection based on net present value (NPV) and a stage gate process seemed the best fit whereas for radical innovation projects different selection criteria on early stages were used and funding decisions were made stage by stage taking mainly market and sales channel development into account. (Weigel & Goffin, 2015)

As a result, Cui at al. suggest the managerial implications for provider selection and management as shown in Figure 2-9.

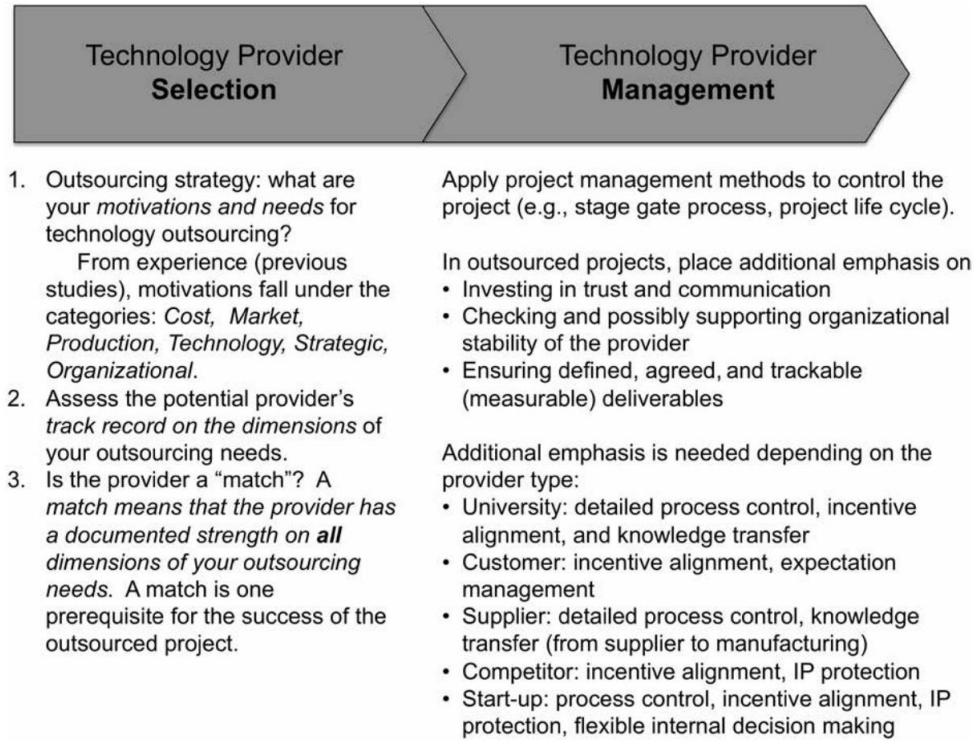


Figure 2-9 Managerial Implications for Provider Selection and Management (Cui et al., 2012, p. 45)

One of the restrictions of the study is that it was conducted in Siemens and therefore, the applicability to other industries, i.e. the service industry or the financial industry is questionable.

On the **number of criteria** which shall be used in scoring tools, there is no general right answer. Some authors suggest: "Between five and eight criteria seems a good compromise" (Goffin & Mitchell, 2017, p. 231).

The question of **weighing the criteria** can also be discussed controversially. One creative approach which can bring more rationality into the weighing of selection criteria is pair-wise comparison and the application of the '*Analytical Hierarchy Process'* (AHP). The AHP allows first to weigh the main criteria – often by using pairwise comparison – and then the sub-criteria. There is plenty of literature on the methodology and even specialized SW tools supporting it available (Wind & Saaty, 1980). An example of how the AHP can be applied in the selection of suppliers in the automotive industry is given in the Figure 2-10 (Study & Jayant, 2018, p. 39). It shows that first the attributes and then the alternatives undergo a pairwise comparison.

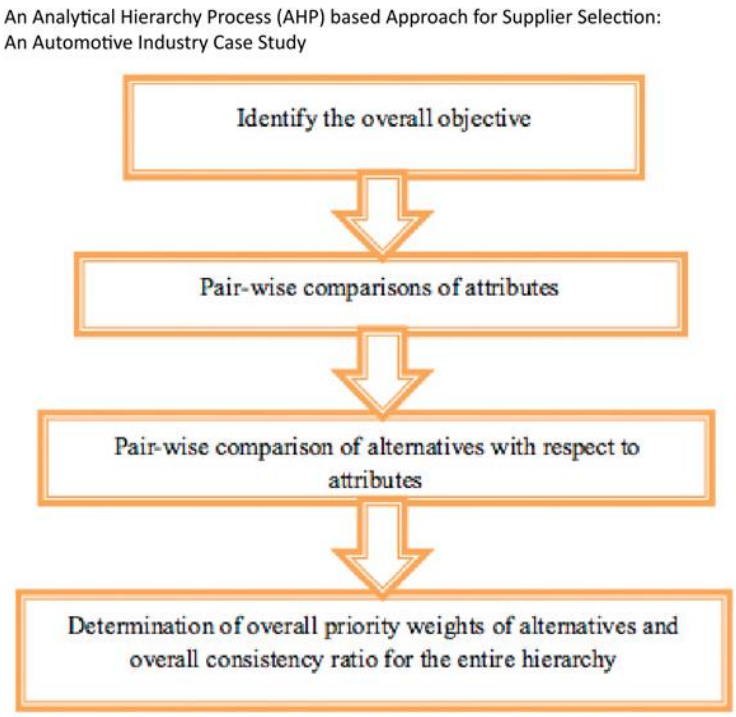


Figure 2-10 Steps of the Analytical Hierarchy Process (Study & Jayant, 2018, p. 39)

"The major advantages of this research are that it can be used for both qualitative and quantitative criteria. Pair-wise comparison used in this work reduces the dependency of the model on human judgment. […] The final priority weight of each alternative at the last level of the hierarchy will lead to a recommended best option. It can be concluded that the model could facilitate decision making. The approach could help in reducing time consuming efforts in the vendor selection process." (Study & Jayant, 2018, p. 43)

In summary, it can be stated that even though non-financial selection methods seem to have many advantages when it comes to select startups there are considerable gaps in the literature and in understanding how this could best be done. The few studies which could be found at the time of writing this thesis ware either more generically investigating the selection of innovation projects or very exploratory and narrow in either examining only to one player or small group of players in the innovation ecosystem.

The next section will deal with the available software systems supporting (open-)innovation.

2.5 Tool Support for Innovation Management and Startup Selection

As we have seen in previous sections, with competition getting fiercer and product lifecycles shortening, innovation management became a topic to almost all companies. Larger companies have many challenges to manage the innovation process across the entire organization properly. Questions

how to involve up to thousands of employees, customers, external partners like vendors, or how to include startups into the innovation process are getting more and more vivid.

A lot of strategic and conceptual questions must be addressed, and guidelines and processes must be developed. This did attract multiple consulting companies to build tailor-made consulting products to help corporations in various industries to improve their innovation management.

However, innovation management also involves much communication, analyses, as well as manual and repetitive work, which can be automated and improved by specialized software products. Consequently, in the last 15 years, several software solutions to support companies to manage the innovation process more efficiently have been established.

Analysts like Gartner, Forrester, and Info-Tech issue their reports analyzing the strength and weaknesses, the completeness of vision as well as the ability to execute of this growing number of innovation management software vendors.

Forrester sees the innovation management solution market as growing but still highly fragmented when estimating “The innovation management market is growing, but at a market size of approximately $150 to $200 million, it remains very small when compared with other software segments. Spigit is the largest vendor of innovation management solutions, but the market is characterized by a very long tail of very small vendors” (Bieler, Dan; Matzke Pascal; Stoica, 2016, p. 2).

The study at hand shall not replace the in-depth analyses of special software-products done by these analysts but shall pinpoint the latest trends and shall derive some indication of the needs of practitioners, especially when looking into their startup selection challenges.

The IT-analysts usually look at the top of the market and try to help practitioners of larger companies who can afford to buy their reports to find the right software-solution. Especially the market of innovation management software is still emerging and therefore a look into the upcoming new, and often very small challengers, who are not covered by the analyst reports is worth the while. As an example, the current ranking of Forrester is shown in Figure 2-11.

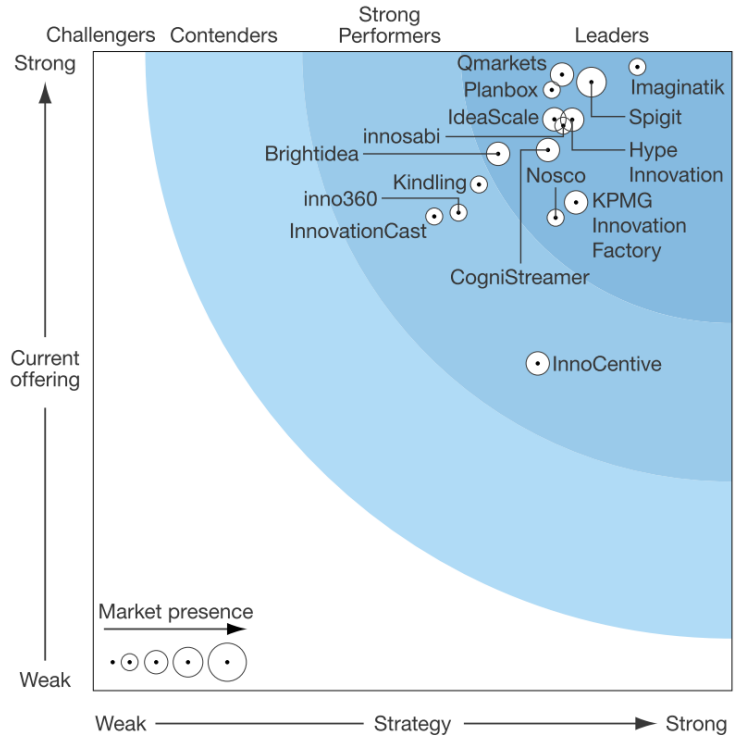


Figure 2-11 Forrester Wave: Innovation Management Solutions, Q2 2016 (Bieler, Dan; Matzke Pascal; Stoica, 2016, p. 12)

A list of vendors who are frequently ranked amongst the leaders by the analysts mentioned above shall help the practitioner and reader of this master thesis to get some orientation of the current innovation SW market and the usual functionality offered. This list is shown in table 2-7 and describes the key functionality, and analyses that functionality regarding open-innovation and startup selection.

Table 2-7 Popular Innovation Management SW Key Functionality and Startup Selection Capability

Innovation Managemet SW	webpage	Key Functionality	Open Innovation/ Startup Selection Functionality
spigit panview	https://www.spigit.com	Generate strategic challenges Idea generation (similar existing ideas dedected) Evaluation (votes, stage gate, pairwise evaluation, expert view, scorecard) Metrix and reporting	open innovation plattform lets customers and partners participate no startup selection functionality
panbox	https://www.planbox.com/	former imaginatic now merged with planbox Self driving Innovation is AI powered (AI searches for ideas in multiple inernal and external documents) internal and external croudsourcing Gamification Evaluation and Business Case builder strong services team of consultants	Open Innovation functionality allows to engage with customers and partners AI can help scout
hype innovation	https://www.hypeinnovation.com/home	link to Trendone as Trendexporer Idea generation Collaboration Evaluation (votes, expert views, pairwise evaluation, scorecard) Implementation (business case, KPI tracking) APIs to integrate in ERP, ECM, Jive, Yammer, …	open innovation plattform some open APIs no explicit feeds for starups no explicit startup selection functionality coopaeration with NineSigma for scouting and curated network of industry professionals
Qmarkets	https://www.qmarkets.net/	Generate Ideas (Brainstorming function, …) Evaluate internal and external ideas, crowdsourcing ideation Scouting function - link startup portfolio Measure ROI (budgetding functions, …) Big Data analytics	open innovation plattfrom, involve customers and partners open APIs to scout trends, startups Crunchbase feed for startup deal flow some startup selection functionality
ideascale	https://ideascale.com/	Generate Ideas (post them and vote) Build and collaborate with teams Refine ideas Estimate ROI (wigh criteria) Include expert rewiew	open innovation restricted to involve customers or partners
KPMG Innovation Factory	https://smarttech.kpmg.nl/en/innovation-factory	Crowdsourcing Ideation (to customers, partners, vendors, starups) Product Portfolio Management Collaboration in an innovation toolkit strong consulting arm	open innovation restricted to involve customers or partners
Brightidea	https://www.brightidea.com/	crowdsourcing Ideation (to customers, partners, vendors, starups) Create - curate - implement functions Accelerate- scout - venture functions	Open innovation includes scouting curating and evaluation of startups API integration with collaboration like Jive, sharepoint, Yammer, IBM Connections

To summarize, most of the leading innovation management tools are motivated by the goal to capture and lead ideas from various departments in a larger organization through a structured innovation process. The typical phases, like problem investigation, idea generation, refinement, evaluation and selection, are mostly well covered by all the leading tools.

Most tools, however, only recently included functionalities covering the open innovation process and today can involve ideation from customers, partners, and other sources. Most tools still miss a comprehensive solution for selecting and integrating startups. To achieve this, the software needed to become open to feed in startups from various scouting platforms and add or be customized to involve selection criteria and processes which fit the startup selection challenge. Some traditional players have already envisaged this challenge and added easy plugins and APIs to open to accelerators or other

scouting platforms. They can easily use their superior evaluation mechanisms and collaborative engines to evaluate not only ideas coming from employees, customers and partners but also to evaluate startups (see the example of Brightdata or Qmarkets in the list above).

Additionally, there are some software tools which explicitly focus on startup scouting and selection or offer a view which is more focused on the accelerator and VC market. Most of these companies are still very young and small and can be called startups by themselves. Table 2-8 gives an overview of some of these new software and services companies and their positioning and core functionality.

Table 2-8 Startup Scouting and Selection Software

Startup Scouting and Selection Software	webpage	Key Functionality	Positioning
Guest	https://gust.com/	focus on startups guidance, offers legal and funding support offers startup screening and selection methods for accelerators and investors integrates with slack, salesforce, Google Apps, insighly…	Gust is a funding platform for the sourcing and management of early-stage investments. It enables entrepreneurs to collaborate with the investors and angel investor networks and has already a network of 650.000 founders and 80.000 investment professionals
F6S	https://www.f6s.com/	startups can apply for funding, acceleration, … accelerators and funds can scout and evaluate (very basic) startups	F6S is home to over a million tech founders, 800k startups and more than 10,000 startup programs globally. F6S delivers founders growth through startup programs, opportunities to drive traction, grants and services.
YouNoodle	https://younoodle.com/	free application for startups corporates can go through a 9 steps startups scouting and selection process strong expert network to help select	all about startup engagement - growing network of 200k startups, companies partner to execute startup and innovation programs. 20k experts to judge startups
CB Insights	https://www.cbinsights.com/	Research and trends Patent Trends Scout investments and exists Market map maker	machine intelligence platform, intelligence analysts, and global network of executives and startups
Crunchbase	https://www.crunchbase.com/	database to find and track startups on various criteria like investment they got, exits they made, managment, … startups can find investors	Crunchbase is a platform for finding business information about private and public companies. Crunchbase information includes investments and funding information, founding members and individuals in leadership positions, mergers and acquisitions, news, and industry trends.
Widerpool	https://www.widerpool.com/	innovation plattform supports, need idenfication, promotion & souting, curation & duediligence, selection with expert jury, integration & investment	WiderPool identifies, scouts and qualifies the best technological solutions provided by startups worldwide for corporates
Dealmatrix	https://dealmatrix.com/	appliction and database allows internal innovation projects, patent data and startups to be inserted, searched and selected via scorecard methods	software solutions for innovation scouting, screening, scoring, reporting, data analytics, collaboration and benchmarking

Looking at these new challengers in the innovation management software market, one can now see some companies starting their products and services with a solution for open innovation, startup scouting, and selection. The first integrated solutions, which cater to both internal and external innovation, also appeared (Dealmatrix for example) on the market. Some of these platforms have already attracted or loaded tens to hundreds of thousands of startups into their databases and attracted thousands of experts and many corporates and accelerators to use them.

The author expects the functionality of internal and external innovation management SW to merge more and more in the future. The innovation software market is still immature, with nimble startups still entering the space. At the same time, network-effects will drive further consolidation. Also, a trend seen by some of the leading analysts: “Today’s market remains fragmented and mostly populated by local players that primarily serve local subsidiaries of global companies. However, we expect the market to consolidate to global players” (Bieler, Dan; Matzke Pascal; Stoica, 2016, p. 6).

The winners will create very open platforms which allow connection of other players and technology providers like collaboration and portfolio management solutions and global acceleration networks via open APIs and partnerships. This trend can already be perceived when looking at the more successful examples given above. Another recent trend is the integration of more artificial intelligence into the systems to improve the scouting and evaluation functionality.

2.6 Conclusion

The theoretical part of this thesis discusses the terms and frameworks of innovation and open innovation. The open innovation framework and the innovation pentathlon framework are applied and used to put the central scientific question of startup selection into a wider context, thus creating a startup selection framework.

The most important players in the open innovation ecosystem were introduced and their possible role in selecting startups was discussed.

Theories and methodologies for selecting innovation were introduced and critically discussed in terms of their utility to serve the more specific startup selection problem.

A view into the psychology and the behavioral economics of selection processes warns against following intuition blindly. Portfolio theory, financial and non-financial methodologies for selecting innovation were described and discussed, and software tools, which support innovation and startup selection, were classified.

The literature review was guided by the aim to find facts which will give innovation managers help and guidance to select the right startups.

The central scientific question of this thesis “How can the startup selection problem in open innovation be solved most effectively and efficiently?” cannot be sufficiently solved by a pure literature study. As the science of innovation is still young, there is no universal innovation theory and no theory on open innovation nor on startup selection. Only very rarely were robust causal relationships discovered so it is too early to derive strong hypothesis which describe cause and effect relationships. However, literature study and experience provide some interesting theses (Brühl, 2011) which can contribute to

enhance the knowledge in the areas of the sub-questions introduced in Section 1.1 and can be further investigated. These theses are described in the text below and depicted in their relation to the scientific questions in Table 2-9. In the text they are referred to as (hypo-)theses to emphasize their rather descriptive nature.

Sub-question 1: How can innovation strategy support the selection of startups?

As shown in Section 1.2 innovation seems to have a high and rising importance, but a clear definition might still be missing in theory and in the minds of the practitioners. Companies might see the risk of disruption, but they seem to still invest only very little in radical innovation.

Sub-question 2: Do companies follow a clear innovation process to support startup selection?

Section 1.2.4 shows some research examples which indicate that companies have difficulties to define or execute their innovation processes.

Sub-question 3: Where do companies find the right startups and how much scouting is needed?

Section 2.3 indicates that the innovation ecosystem is quickly expanding indicating that companies might not know or use all their potential sources to find startups. The failure rate seems high as shown in Section 1.2.5 and 2.2.2.

Sub-question 4: Which methodologies and criteria are best suited to select startups?

As there is a lack of literature and theory as shown in Section 1.2.5 companies might not even have a clear selection methodology. The problems which could be elaborated in critically discussing portfolio theory and financial selection methods indicate that financial methods might play a less important role in startup selection than in other innovation related selection processes. As selection criteria for related problems could be found there is reason to assume that some well fitted startup selection criteria can be found.

Sub-question 5: Who is and shall be involved in the selection process?

There is evidence that a lot of departments are involved in the process (YOUNIS et al., 2017, p. 19) and the author also found that more and more companies seem to involve external experts.

Sub-question 6: What is the current and the desired tool support for the selection process?

The growing number of SW solutions and the growing number of startups evaluated which are evaluated by companies indicates that there is a need for enhanced tool support.

Table 2-9 describes the link of the research questions to the (hypo-)theses derived from literature research and from the practical experience of the author. In total the six sub-questions are related to 14 (hypo-)theses.

Table 2-9 Link of Research Questions to (Hypo-)theses

Research Question	RQ Nr	(Hypo-)thesis	Thesis Nr
How does innovation strategy support the selection of startups?	1	There is no consitent definition of innovation	1
How does innovation strategy support the selection of startups?	1	Innovation has a high and rising strategic importance	2
How does innovation strategy support the selection of startups?	1	Open Innovation especially the scouting and selecting of startups is important	3
How does innovation strategy support the selection of startups?	1	Although companies see the risk of being disrupted, they invest only a small proportion of their budget in radical innovation	4
Do companies follow a clear innovation process to support startup selection?	2	Companies do not follow a clear innovation process	5
Do companies follow a clear innovation process to support startup selection?	2	It is hard to perfrom well in important steps of the innovation process	6
Where do companies find the right startups and how much scouting is needed?	3	Companies know and use only a few of the possible instruments for scouting startups	7
Where do companies find the right startups and how much scouting is needed?	3	Companies only successfully implement solutions of a very small fraction of all the startups they analyze	8
Which methodologies and criteria are best suited to select startups?	4	Companies do not have a clar selection methodology	9
Which methodologies and criteria are best suited to select startups?	4	Non-financial methods (i.e. scoring) play a more important role when it comes to startup selection than financial methods (i.e. NPV)	10
Which methodologies and criteria are best suited to select startups?	4	Some universally important startup selection criteria can be found	11
Who is and shall be involved in the selection process?	5	There are multiple departments involved in the selection of startups	12
Who is and shall be involved in the selection process?	5	There is a need for external help in the selection process.	13
What is the current and the desired tool support for the selection process?	6	There is a need for a platform which assists the open innovation and startup selection process	14

Even though most companies run open innovation programs today and there is a growing need to evaluate and select large numbers of startups it showed that current literature and theory alone does not contribute enough specific answers and guidance for practitioners.

The following chapter shall, therefore, describe the methodology chosen to contribute to answer the open questions.

3 METHODOLOGY

3.1 Introduction

Chapter 1 of this master thesis has shown how important it is to deal with innovation on a macro- and micro economic level and introduced the scientific questions of this work. Chapter 2 then defined critical technical terms and introduced and applied central concepts and frameworks of (open-)innovation. Selection methodologies could be described on a theoretical level.

This chapter focuses on methodology and shall explain how theoretical concepts were found and which methodology was chosen to test these concepts in the real world.

The scientific process is described in Section 3.2, and it is reasoned why the author chose the methodologies applied to answer the scientific questions introduced in section 1.1 and test the (hypo-)thesis depicted in Section 2.6.

The primary methodologies, literature research, and qualitative expert interviews are described in detail. Literature research is depicted in Section 3.3. Section 3.4 introduces the number and nature of the expert interviews. In Section 3.5 it is clarified how the questions for the expert interviews link to the (hypo-)thesis listed in Section 2.6. It is explained why and how the expert sample was chosen (Section 3.7) and how the data for the qualitative study was collected (Section 3.8) and analyzed (Section 3.9). Special attention was given to Mayring´s method of '*Qualitative Content Analyses*'.

3.2 Scientific process and selection of methodology

The scientific process followed in this master thesis can be described as shown in Figure 3-1:

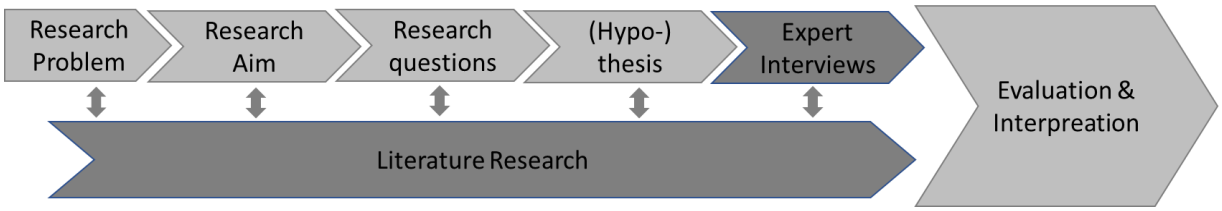


Figure 3-1 Scientific Process and Methods

In his practical work as a manager and consultant of large corporations and of startups, the author envisaged a rising interest in open innovation but a lack of professionalism, know-how, and transparency amongst practitioners. Although the search for and selection of startups became more and more critical for corporations, VCs and CVCs, there seemed to be neither an established best

practice nor an understanding of the possibilities and the right methodology to excel in open innovation.

This **real-life experience** led to formulate a first high-level **research problem** and the thesis that there is much to be done to improve the situation.

As a next step, the research **aim** and some **high-level research questions** were formulated.

As depicted in Section 1.1, the thesis aims to give innovation managers help and guidance on how to select the right startups, and the central scientific question of this thesis is how the startup selection problem in open innovation can be solved most effectively and efficiently.

As a **first step,** in-depth **literature research** was conducted. Innovation management and especially open innovation are very new research topics but screening the international scientific literature for theories and methods to help practitioners seemed to be a helpful way to reach the thesis' research aim.

Although there was a high number of publications on innovation - Amazon finds over 80.000 entries (Amazon, 2019a) and also Amazon displays over 4.000 search entries on open innovation (Amazon, 2019b) there seemed to be a lack of literature and understanding on how especially the selection process of startups should be performed (Cui et al., 2012, p. 29).

The theory on open innovation is still immature, and although the researcher could find some high-level frameworks, no consistent theory on open innovation was established at the time of writing this master thesis. Literature provided a series of thesis to describe the new phenomenon but very little real hypothesis which could assign causes to effects.

Nevertheless, the literature review could help to understand the research problem better, sharpen the research aim, and detail the research questions. Most importantly, some studies could provide hints on how open innovation was dealt with and who were the players in the innovation ecosystem. Some recent articles and studies helped to describe some methods and criteria which might be useful in startup selection. This was a valuable input to formulate thesis which could later be checked and refined in the next step the qualitative expert interviews.

As a **second step,** a **qualitative study with semi-structured expert interviews** was chosen. This should help to investigate how practitioners approach open innovation and especially how they solve the startup selection problem. Possible solutions and best practices should be found.

As the topic was not yet well explored in literature, a qualitative study would also likely help to discover new ways how to treat the topic. Qualitative studies provide the chance to learn about and detect completely new habits and methods which might be established and used by practitioners but have not yet been described and analyzed by quantitative science. Therefore, a qualitative research

approach was chosen over a more rigid, merely quantitative research. However, the author hopes that a follow-up quantitative research can be based on this qualitative study in the future.

This master thesis is, therefore, mainly built on two closely interrelated methods and data sources:

- Literature Research and
- Semi-structured Expert Interviews

Although sequentially literature research played a stronger role at the beginning of this scientific work, there was always a feedback loop built in, and literature research continued throughout the entire work process.

3.3 Literature Research

As described above in-depth literature research was the first step. It was conducted between October 2018 and March 2019.

Aims of this literature research were:

- Getting a state-of-the-art picture on open innovation and startup selection
- Finding possible gaps in the literature
- Refining the research questions
- Finding hints on theoretical methods of startup selection
- Finding descriptions of open innovation processes
- Finding categories or selection criteria which help in the startup selection

The literature research followed a **funneled approach** as it started with more general topics and became more and more specialized throughout scientific work, as represented in Figure 3-2.

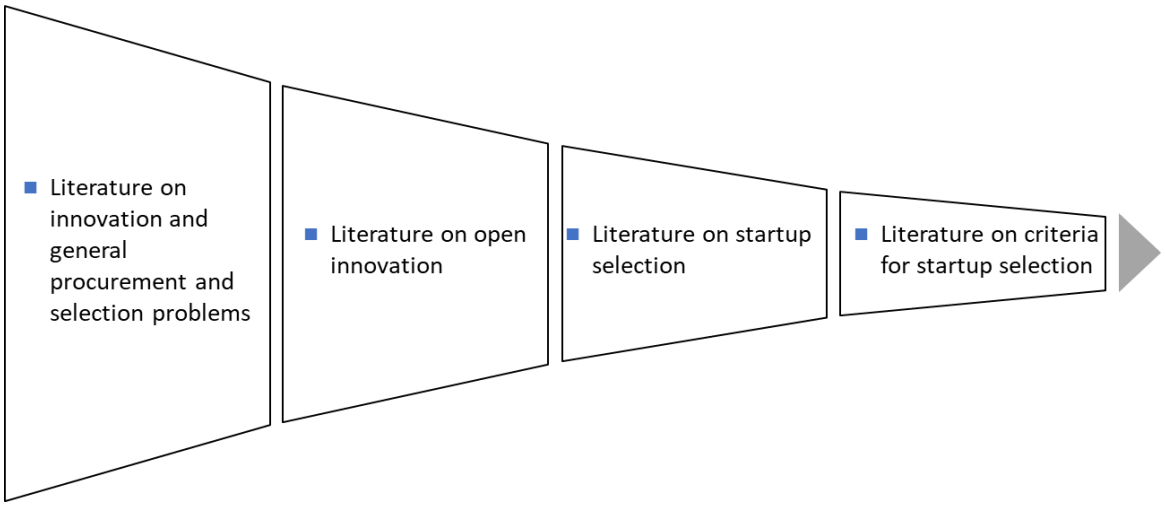


Figure 3-2 Funnel of Specialization in Literature Research

The starting point of the literature search was in the innovation and procurement literature. The author established through his contact with CIOs and CEOs that currently the main problem was how to purchase innovation. Therefore, the focus of the literature research shifted to this topic.

Innovation literature is still a vast field of science, and it became clear that the author would specialize in the most burning issues in innovation. Open innovation and the work with startups were the hot topics of the time. So general literature on innovation and procurement was only used to the degree that it contributed to the startup selection problem in open innovation.

In general, only very recent publications – more than 95% – published after the cambric explosion of open innovation publications in 2006 were used. Classic works which were published earlier, and which deal with innovation and selection problems were only used and quoted when they could directly contribute to the very recent problem of startup selection.

To find relevant literature, mainly keyword search using Boolean algebra was conducted. Main **sources** have been:

- Library search at Modul University
- Library search at Wirschaftsuniversität Wien
- Library search on the London School of Economics
- Amazon – mainly to find classical textbooks and new publications
- EBSCO Host
- Science Direct
- Mendeley
- Google Scholar

Many good sources of literature could be found by asking interview partners and experts in the field of innovation as well as academics. Special literature input came from

- David Teece, Berkeley Research Group, LLC, 2200 Powell Street, Suite 1200, Emeryville, CA 94608
- Dr. Kathrin Reinsberger, Institute for Entrepreneurship & Innovation, WU - Vienna University of Economics and Business, Welthandelsplatz 2, A-1020 Vienna

An essential source of studies and information have also been the publications of management consultants who started to discover the urgent need for consultancy support and fact-based information for corporates on the topic of open innovation. This includes recent studies of specialized consultants like CB-Insights but also traditional management consultants like KPMG, PWC, Boston Consulting Group or Accenture, to name a few.

Around one dozen of the most popular standard textbooks and current innovation books have been acquired. The focus of the literature review was on recent scientific articles. Concerning the articles, the focus was on freely accessible sources.

Mendeley proved helpful not only as a reference manager but also a source to find literature and connect with other scientists. “Mendeley is a free reference manager and academic social network that can help you organize your research, collaborate with others online, and discover the latest research” (Https://www.elsevier.com/solutions/mendeley, n.d.) It is developed and distributed by the Dutch information and analytics company Elsevier.

3.4 Expert Interviews

To test the thesis derived from practical experience and the literature study, a qualitative study using semi-structured expert interviews was chosen. In total, 16 expert interviews were conducted between 20th of January 2019 and 21st of March 2019.

The interviewees were first approached by individualized e-mails, but each participant was also sent a standard introductory document, which can be found in the Appendix 1 of this thesis. This introduction paper was stating:

- The motivation of the thesis and the fact that it is part of the authors master thesis on Modul University
- The benefits of participation
- The expected duration of the expert interview and
- The key topics
- The fact that the interviews are used for academic purposes and that the data will be treated anonymously

Following the e-mail, with the introduction paper, the interviewees were approached by telephone and the specific dates, time, and the location respectively, the teleconferencing platform were fixed. The expert interviews were all based on voluntary participation; no fee was paid to compensate for the time and effort.

3.5 Interview Guideline and Link to the (Hypo-)theses of the Research

The expert interviews were based on a semi-structured interview guideline. The interview guideline can be found in the Appendix 2 of this master thesis. Semi-structured interviews were chosen as the sample consisted of managers who were high in the hierarchy and would not likely give their time

more than once. As Bernard suggests, “In situations where you won´t get more than one chance to interview someone, semistructured interviewing is best” (Bernard, 2013, p. 182).

The interview guideline was not sent out to the participants before the interview and was not handed over to the participants during or after the interview. However, the appropriate Likert Scales (Brown, 2010) which were used in some questions have been shown to the participants to make it easier to answer without remembering all the categories of the Likert scale. This could be achieved in both face-to-face interviews – by showing a hard copy of the particular part of the interview guideline and in the video conferences – where the categories could be shown via screen sharing.

The essential part of creating the interview guideline was to find the right mix of open and closed questions to test the (hypo-)thesis found during the literature review. Especially open questions shall discover completely new categories and underscore the explorative nature of the study, which best fitted the novelty of the topic. On the other hand, closed questions using rating scales were also used frequently. This enables the reader to see tendencies and shall serve as the basis of further hypothesis which can be tested in future quantitative research. The rating scales were based on Likert (Brown, 2010). Some questions offered even other deliberately uneven scales to force a decision to either side of the spectrum. New topics tended to start with an open question and follow up with a list of criteria found in the literature research. Even when giving a list of criteria or items to choose from these lists were mostly open in the way that the participant could choose or name further items. This enabled to also detect new items or categories not yet mentioned by the literature.

The personal or videoconference interviews were designed to take 30 to 40 minutes and to cover the following key topics:

- Definition and Importance of innovation
- Investments in internal innovation (R&D) vs. open innovation (startups)
- Risks of being disrupted and how much is invested in incremental vs. disruptive innovation
- Difficulties in the innovation process
- Sources to find (scout) the right startups
- Number of startups evaluated, and successful projects implemented
- Methods and criteria used in the selection process
- Persons involved in the innovation/selection process
- Current and desired tool support

The questions in the interview guideline were designed to test the (hypo-)thesis established through the literature research (see Section 2.6). Table 3-1 shows which interview questions (Q1 to Q23) as depicted in Appendix 2 were chosen to test which (hypo-)thesis (T1 to T14). The research questions (RQ1 to RQ6) which were introduced in Section 1.3 and linked to the (hypo-)theses in Section 2.6 are also given as a reference in the table.

Table 3-1 Link of (Hypo-)theses to Interview Questions

Research Question	Nr	(Hypo-)thesis	Number of question in the interviwe guideline
RQ1	T1	There is no consitent definition of innovation	Q1
RQ1	T2	Innovation has a high and rising strategic importance	Q2, Q2a, Q3
RQ1	T3	Open innovation especially the scouting and selecting of startups are important	Q4
RQ1	T4	Although companies see the risk of being disrupted, they invest only a small proportion of their budget in radical innovation	Q5, Q6
RQ2	T5	Companies do not follow a clear innovation process	Q7, Q7a
RQ2	T6	It is hard to perfrom well in important steps of the innovation process	Q9, Q10
RQ3	T7	Companies know and use only a few of the possible instruments for scouting startups	Q11, Q12
RQ3	T8	Companies only successfully implement solutions of a very small fraction of all the startups they analyze	Q13, Q14
RQ4	T9	Companies do not have a clar selection methodology	Q15a
RQ4	T10	Non-financial methods (i.e. scoring) play a more important role when it comes to startup selection than financial methods (i.e. NPV)	Q15b
RQ4	T11	Some universally important startup selection criteria can be found	Q16a, Q16b
RQ5	T12	There are multiple departments involved in the selection of startups	Q17a, Q17b
RQ5	T13	There is a need for external help in the selection process.	Q18, Q18a, Q19, Q19a, Q20
RQ6	T14	There is a need for a platform which assists the open innovation and startup selection process	Q22, Q23

3.6 Pilot Test

In January 2019, two pilot tests for the expert interviews were conducted. The pilot interviews had the aim to test the length of the interview and how good the participants could understand the questions.

The first pilot was performed face to face and was not recorded, but notes have been taken. It led to significant changes in the order and the formulation of the questions. More open questions were included, and some scales were changed.

The second pilot was targeted not only to test the interview guideline, the flow of questions, and the ability to comprehend the questions but to also test the remote recording capabilities in a GoToMeeting https://www.gotomeeting.com session.

3.7 Interview Population Sampling

When it comes to interview population sampling, the author had to answer two questions.

1. Who shall be in the sample and which characteristics the interviewees or informants shall have?
2. How large shall the sample be?

To solve the first question there were only a few hints in the literature as the innovation ecosystem was just evolving at the time of writing this thesis. Therefore, the main challenge was to find interview partners who would:

- encounter the startup selection problem and deal with it regularly
- be willing to talk about it in an open and unbiased way

Literature, however, indicated that the owners of startup selection problems would be found in large organizations or VCs as they started to institutionalize open innovation and would attract a large deal flow of startup applicants. The experts would be the heads of the still rather small innovation departments (YOUNIS et al., 2017, pp. 14–15) of large corporates or the C-Level top managers to whom those innovation managers report (CBinsights, 2018, p. 20). Also, partners or managers of VCs would have a similarity large deal flow to manage and would provide good interview partners.

As the author was interested in how this sensitive issue was treated and as there was the risk that randomly chosen informants would either not have the required knowledge or would not openly speak about the topic a nonprobability sampling was chosen as a sampling method. “This means choosing cases on purpose, not randomly. In-depth research on sensitive topics requires nonprobability sampling” (Bernard, 2013, p. 162). The author intended to find out how innovation experts saw the topic of open innovation and startup selection. These experts can be viewed as part of the clan of innovation leaders, and the study aims more about the social behavior in that cultural clan then about individuals. This again speaks for a nonprobability sampling method. “[…] when you are collecting cultural data, as contrasted with data about individuals, then expert informants, not randomly selected respondents, are what you really need” (Bernard, 2013, p. 163).

The method to find interview partners with the right background, skills and willingness to respond openly can be called purposive sampling as H. Russell Bernard defines “In purposeful sampling, you decide the purpose you want informants (or communities) to serve, and you go out to find some” (Bernard, 2013, p. 164). Bernard finds pilot studies and hard-to-find populations amongst the good reasons for using purposive sampling.

Given the main characteristics stated above the author tried to incorporate experts from a greater variety of industries and a variety of geographic regions in the sample to avoid biases and derive results which can more easily be generalized.

The main criteria for interviewees to get into the sample were:

1. assuming a C-Level or head of innovation role
2. being willing to talk about their innovation strategy and best practices in an open and unbiased way
3. working in a large organization or VC
4. come from as many different countries and industries as possible

The sample included the organizations and top managers, listed in table 3-2.

Table 3-2 Interview Partners, Organizations

Company	Interviewee	Role	Country	Industry	Location	Recording and Transcription
Atos IT Solutions	Dipl.-Ing. Christian Polster	Senior Vice President bei Atos IT Solutions and Services	Austria	ICT	face to face Vienna	recorded transcribed (also did Pilot)
C6Bank	Gustavo Torres	Chief Innovation and Experience Officer / Partner at C6 Bank	Brazil	Financial Industry	skype Sao Paulo	recorded transcribed
Deutsche Telekom	MBA Thomas Kicker	SVP Group Business Development and Partnering, Deutsche Telekom	Germany	ICT	skype San Franzisko	recorded transcribed
EC1 Capital	Julian Carter	Founding Partner and Managing Director of EC1 Capital	UK	Venture Capital	ZOOM recording problem London	not recorded not transcribd notes evaluated
EVN AG	Robert Redl	ex CIO (now project manager)	Austria	Energy	GoToMeeting Vienna	Pilot recorded not transcribed
EVN AG	Andrea Edlmann	Head of Innovation and Sustainablility	Austria	Energy	face to face Vienna	recorded transcribed
Kapsch AG	Dr. Franz Semanek	CFO bei Kapsch AG	Austria	ICT	face to face Vienna	recorded transcribed
Ministry of Ecological Transition	Roman Pedro Munoz	Head of devision of technology	Spain	Government	ZOOM Madrid	recorded transcribed
OTP Bank	Andras Fischer	Head of Innovation, Retail Banking	Hungary	Financial Industry	face to face Budapest	recorded transcribed
Raiffeisen Bank	Dr. Walter Mösenbacher	Managing Director bei Raiffeisen e-force	Austria	Financial Industry	face to face Vienna	recorded transcribed
Red Bull	Andreas Gall	Chief Innovation Officer at Red Bull Media House	Austria	FMCG	skype Salzburg	recorded transcribed
Speedinvest	MBA Michael Schuster	Managing Partner Speedinvest	Austria	Venture Capital	face to face Vienna	recorded transcribed
Temenos	Ben Robinson	Chief Strategy Ofricer & Head Of Community for Marketplace	Swizerland	ICT	skype recording problem Geneva	not recorded not transcribd notes evaluated
Verbund	Dr. Michael Strugl	Vice Chairman of the Executive Board	Austria	Energy	face to face Vienna	recorded transcribed
VISA	MBA Otto Williams	Vice President, Head of Strategic Partnerships, Fintech & Ventures CEMEA at Visa	USA	Financial Industry	skype Dubai	recorded transcribed
Vodafone	Dr. Hannes Ametsreiter and Mag. (FH) Michael Jakob Reinartz	CEO Vodafone DE, Member Executive Comittee Vodafone Group, and Director Innovation & Consumer Services @ Vodafone Deutschland	UK	ICT	ZOOM Munich/Düsseldorf	recorded transcribed
Wienerberger	Jörg Reinhold	Chief Information and Digital Officer Wienerberger AG	Austria	Industry	face to face Vienna	recorded transcribed

All respondents were either C-Level or reporting directly into C-Level. All respondents did take part voluntarily and have not been paid. They all were motivated and openly talked about the topic.

The second main question the author had to answer was about the **size of the sample**. Following H. Russell Bernard “There is growing evidence that 10-20 knowledgeable people are enough to uncover

and understand the core categories in any well-defined cultural domain or study of lived experience" (Bernard, 2013, p. 175). The author could also experience the decreasing marginal benefit of new interviews after having analyzed the first 10 and then added further interviews. The number of 16 interviews in the sample meets this threshold.

In total, 16 semi-structured expert interviews (I1 to I16) plus two pilot interviews (P1, P2) were conducted. The field phase took place between 4th of January 2019, where the first pilot interview took place to the 21st of March, where the last expert interview was held.

All 13 corporate participants represented large international organizations, with more than five thousand employees (see Figure 3-3). Naturally, the VCs and the department of the governmental body were smaller.

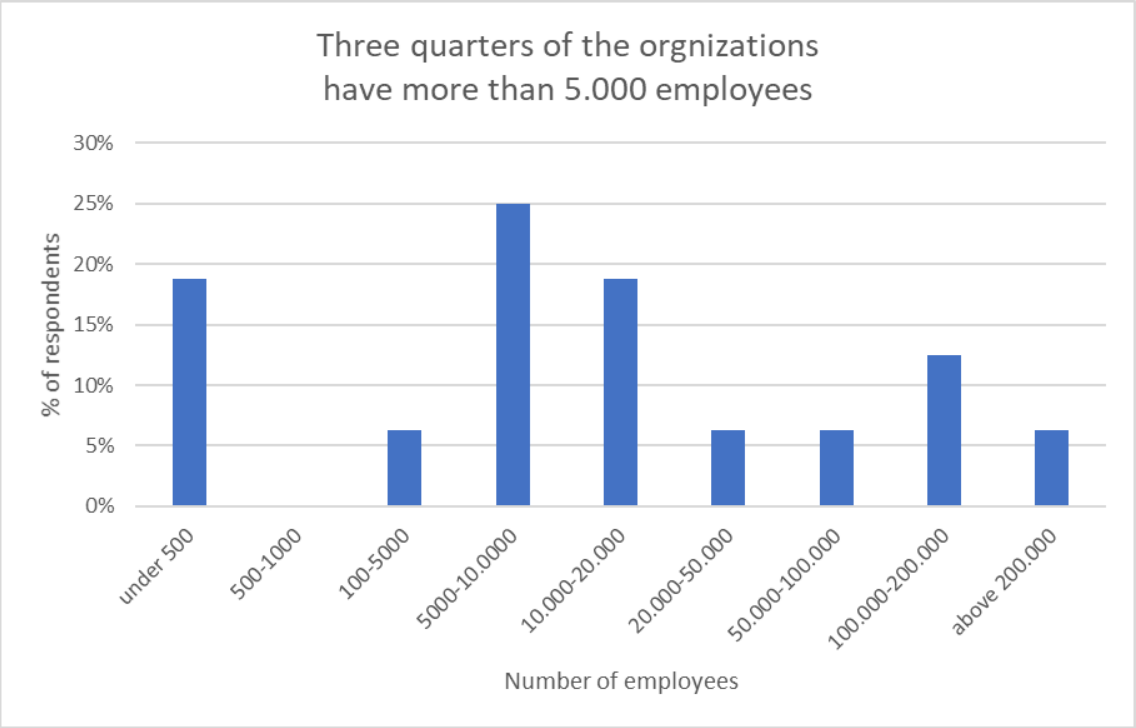


Figure 3-3 Sample Company Size

The companies in the sample encompass seven different industries. The distribution of the sample to the different industries can be seen in Figure 3-4.

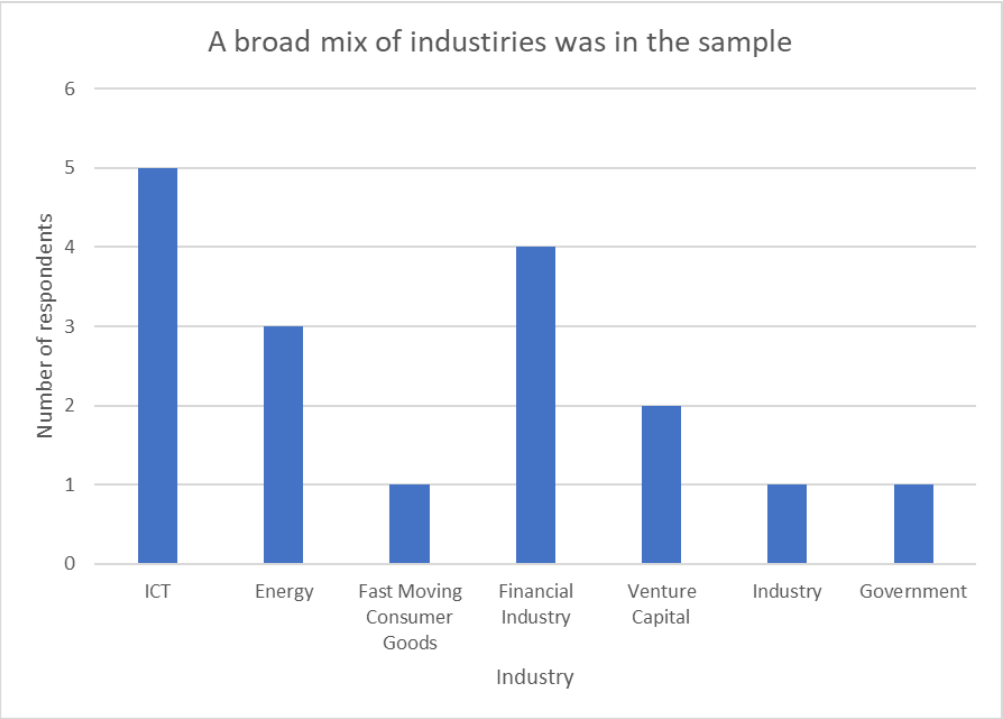


Figure 3-4 Sample Industry of Participating Organization

Half of the responding organizations had their HQ outside of Austria. The distribution of different countries can be seen in Figure 3-5.

Figure 3-5 Sample Regional Distribution

3.8 Data Collection

There has been nine face to face interviews which were recorded by a digital voice recorder (Olympus VN-712PC) and as a backup by i-phone (Audio Memo) in MP3 format. Most interviews were performed

in the offices of the participants in Austria or the neighboring countries. Three interviews were held in public places (coffeehouse). Seven remote interviews were conducted via videoconference. The videoconferences used the recording function in Skype or ZOOM respectively and were saved in MP3 and/or in MP4-Video format. In two of these remote interviews, the recording did not work due to technical issues with the network.

The duration of the recorded interviews is between 23min and one hour. The average duration is 38 min.

The author of this thesis performed all interviews in person and took detailed notes as recommended by Bernard (Bernard, 2013, p. 196) of each interview using a hard copy of the interview guideline (Appendix 2) to note down the answers. This enabled the author also to include the results of the two interviews where the recording did not work, and which therefore could not be transcribed.

3.9 Data analysis – Qualitative Content Analyses (Philipp Mayring)

The data derived by the expert interviews which were recorded were transcribed word by word. This form of the transcript can be called "pure verbatim transcript", according to Mayring (Philippe Mayring, 2014, p. 45). As there are no commonly accepted rules for transcription, the author followed the rules suggested by J. Gläser, G. Laudel (Gläser & Laudel, 2010, p. 193f) as they seem very appropriate for the kind of study at hand. These rules can be summarized as follows:

- The transcription was done word by word, and local language or grammar mistakes have not been corrected or transformed
- Nonverbal expressions (laughing, clearing of one´s throat, coughing, …) were only transcribed if they change the meaning of the text
- Specialties of answers of YES and NO (i.e., hesitant, reluctant, laughing) were marked
- Interruptions or incomprehensible passages are marked

Each line was numbered so that highlights and quotations could be found more quickly in the analyses process (Philipsen, 2019). In total, 131 pages of transcribed material were produced and have been analyzed.

All the interview data was anonymized by attributing a code to each interview. The link between each interview code I1 to I16 to the name of the interviewee and her/his organization is not made explicit to keep the answers anonymous. Whenever a quotation is used in this text, it is not directly attributed to the name or organization of the interviewee but only to the secret code.

After the transcription, the data was analyzed using the methodology of qualitative content analyses developed by Philippe Mayring (Philipp Mayring, 2015a) and by applying descriptive statistics. Thereby

qualitative and quantitative methods were applied. Mayring himself “criticizes the methodological dichotomization of qualitative and quantitative research” and “defines Qualitative Content Analysis as a mixed methods approach (containing qualitative and quantitative steps of analysis) and advocates common research criteria for qualitative and quantitative research” (Philippe Mayring, 2014, p. 6). Mayring´s method of Qualitative Content Analyses was chosen because it offers methods of “systematic, i.e. theory- and rule-bound, textual understanding and textual interpretation” (Philippe Mayring, 2014, p. 63).

Following the methodology of Mayring, the chosen approach was:

- Systematic
- Rule-based and
- Theory-guided

When interpreting the transcribed material, a combination of deductive and inductive methods was applied. Following R. Bernard “All research is, ultimately, a combination of inductive and deductive effort, and there is no point in talking about whether induction or deduction is better” (Bernard, 2013, p. 524). Also, Mayring suggests a combination of the two approaches well beyond all epistemological ideology when he says “Of course the analysis of the textual material can proceed with different inductive and/or deductive content-analytical procedures simultaneously” (Philippe Mayring, 2014, p. 106).

The thesis derived from the literature study could be tested by searching for known categories in the material (deductive category assignment approach), but also new categories and thesis could be derived (through inductive category creation).

To find and evaluate categories which were known from literature research Mayrings structured deductive category assignment (Philippe Mayring, 2014, p. 95) was helpful. Literature-based definitions and anchor examples were found, and clear coding rules were elaborated and applied back to the material at hand (see an example in Appendix 4).

Especially when it came to evaluate and structure the text derived from more structured questions which often included Likert scales, the results were summarized in xls format, and the results could be interpreted using descriptive statistics. Most of these questions were designed to include an element of openness. The respondent could add categories in case he or she was missing items in the lists presented. The more qualitative aspects of the transcribed answers were evaluated and could also be considered in the interpretation. New categories and items named by the interviewees were included in the analyses and could help to form new thesis and can give impulses for further qualitative or quantitative research.

When interpreting the open questions, the more inductive methods suggested by Mayring were applied. New categories could be derived by summarizing and by applying the method of inductive

category formation suggested by Mayring (Philipp Mayring, 2015a, p. 85ff). The transcribed text was carefully read, and the passages relevant to the scientific questions at hand were highlighted using MS-Word (Berger-Grabner, 2016, p. 146). To establish the categories the material was paraphrased, generalized to the required level of abstraction and then reduced by fist cutting paraphrases with identical meaning and then combining paraphrases to form the final categories (Philipp Mayring, 2015b, p. 70). Please find a high-level description of the process in the figure 3-6 and an example of the coding in Appendix 3.

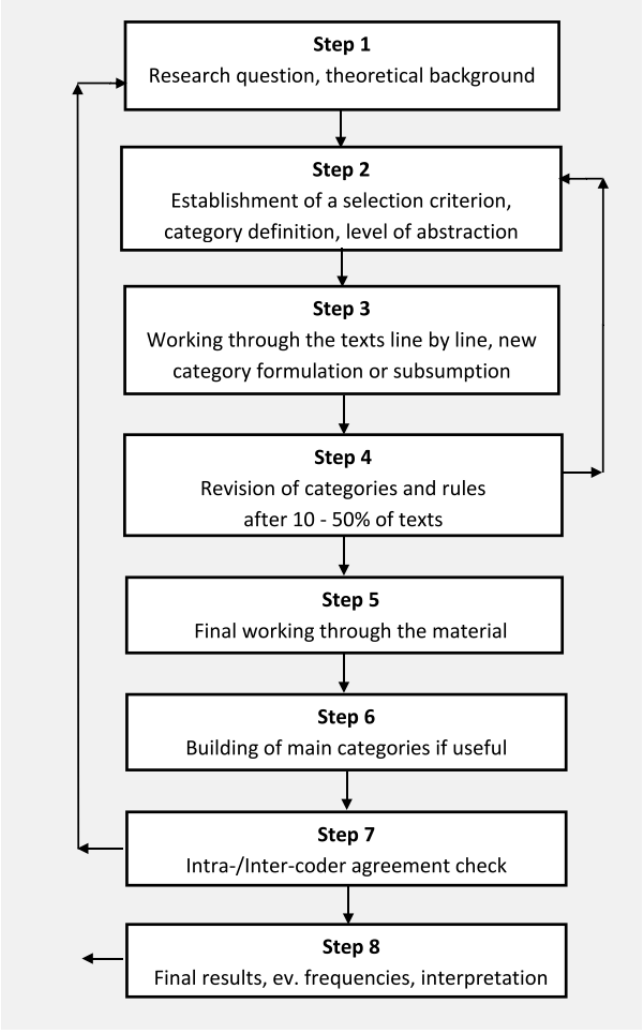


Figure 3-6 Steps of inductive category development (Philippe Mayring, 2014, p. 80 Figure 14)

3.10 Research Timeline

The work on this master thesis started in October 2018, and it was defended on the 24th of June 2019. The main tasks completed, and their duration is depicted in the flow chart in Figure 3-7.

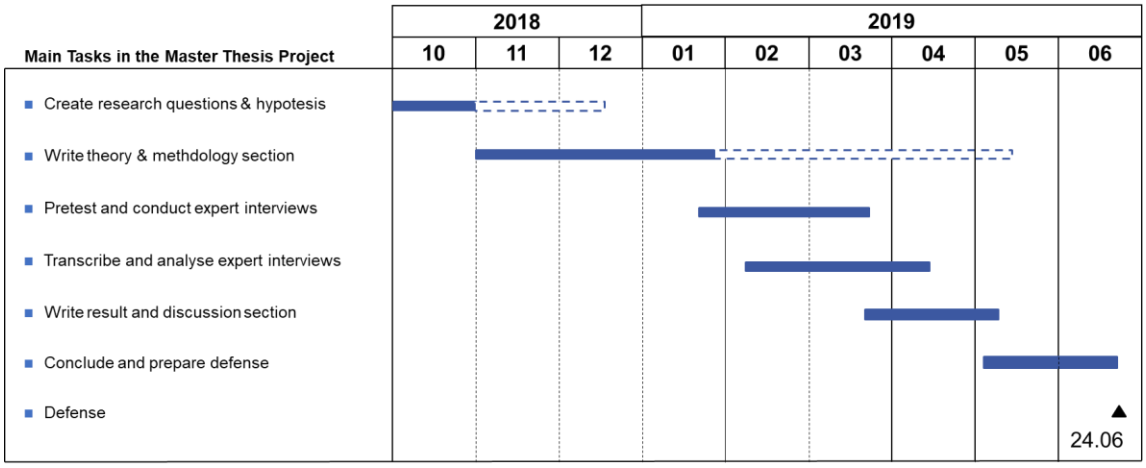


Figure 3-7 Master Thesis Project Plan

As a first step, research questions were formulated which were inspired by many talks with practitioners and the reading of some literature at the forefront of this scientific study. An in-depth literature study began in November 2018 and was concluded in the main part around the end of January 2019. However, there was an iterative process between the following field analyses and the literature work so that the later never really stopped till the end of the process. Beginning of January, the interview guideline was developed, pretested, and refined. End of January the expert interview field phase started took till the end of March. The transcription and analyses of the interviews were done mostly in parallel and ended mid of April. The work on the result and discussion session could also start with the first evaluation of responses, but the main part was conducted after all interviews were finished with the transcription. Mid of May the main parts were finished, and the conclusion was written, and the defense was prepared.

3.11 Conclusion

The methods of literature research combined with an exploratory study including qualitative expert interviews were chosen to fit the novelty of the topic and shall shed light into the central scientific question – how the selection problem in open innovation can be solved more effectively and more efficiently.

The focus was put on the following three methodological topics:

- Creating a clear connection between the (hypo-)thesis derived from the literature study and the field study
- Getting a sample of highly reputable, representative and international experts
- Applying a systematic, rule-based and theory-guided approach to the analyses of the interview material when choosing Mayring´s qualitative content analyses approach

Although standard quality criteria like objectivity, reliability, and validity (Berger-Grabner, 2016, p. 161) were criticized in the context of qualitative studies (Philippe Mayring, 2014, p. 108) the thesis at hand targeted high on scientific quality. The methodology and the coding were well documented, and some coding was done twice with the target to provide some intra-coder reliability. One restriction, however, is that only the author and no second researcher performed the analyses and coding of the transcribed interview texts. Therefore, no test on intercoder reliability, as suggested by some authors (Bernard, 2013, p. 542) was undertaken mainly because of resources restrictions.

The methodologies described in the previous section build the basis for the in-depth analyses and the discussion of the results of the empiric study presented in the next chapter.

4 RESULTS AND DISCUSSION

4.1 Introduction

This chapter will confront the theoretical findings with an in-depth assessment of the views of the practitioners who have taken part in the expert interviews.

The thesis derived from studying the theoretical foundations and existing studies of innovation management in the literature review will be compared against the answers of the experts in the sample.

The chapter is structured around the main topics covered in the interviews and is grouped into the following topics. The respective research question and thesis examined in each section are given in brackets.

- The definition of Innovation and the perception of its importance (Section 4.2, RQ1, T1, T2)
- The risk of disruption and investment into different forms of innovation (Section 4.3, RQ1, T4)
- The level of professionalism in the innovation process (Section 4.4, RQ1, T3, RQ2, T5, T6)
- Searching/Scouting for Startups (Section 4.5, R3, T7)
- Startup selection methods, criteria and people involved in the startup selection process (Section 4.6, R3, T8, R4, T9, T10, T11, R5, T12, T13)
- The status and future of software tools to support the open innovation and startup selection process (R6, T14)

4.2 Understanding of Innovation and its Importance

Any innovation strategy needs to start with the question of what is defined as innovation in a company and how important it is perceived by its top manager (see RQ1 and T1 and T2). Therefore, this study aimed not only to understand the definitions of innovation found in the literature but also to learn how leading practitioners define it.

As seen in Section 2.1.1. the literature does not provide a consistent definition of innovation. In their meta-study of 291 open innovation related publications West and Bogers “found considerable disagreement (if not confusion) within the sample about what constitutes “innovation” “ (West & Bogers, 2014, p. 826).

However, most definitions contain two essential aspects of innovation:

1) The aspect of new products or processes and
2) A kind of (successful) implementation

As K. Goffin and R. Mitchell put it “the dictionary definition of innovation – introducing something new – is clear, but a broader one is needed to help managers or employees understand business innovation” (Goffin & Mitchell, 2017, p. 3).

The expert interviews were evaluated asking the following questions:

- Is there support of the **thesis number 1 that there is no consistent definition of innovation**?
- Do innovation managers state the most important aspects of scientific innovation definitions?
- Which (additional) aspects of innovation might be important for innovation managers?

When interpreting the given responses, it became clear that all 16 interviewees had answered very differently. In that sense, **in line with thesis number 1, no consistent definition of innovation could be found in that sample**.

However, the main aspects found in scientific definitions could also be found in many of the interviews as illustrated by the following quotation of one of the participants: “[…] innovation is not only have a start-up party and be cool […] Innovation on the long run has the aim to build new products and the products have to be successful on the market” (I7 p. 1 line 48ff).

To summarize and categorize the answers given on the open question, Q1: “What is innovation for you?” Mayrings qualitative content analyses was applied. The categories in Table 4-1 were named most frequently by the innovation leaders in the sample.

Table 4-1 Innovation Categories found in Expert Interviews (Q1)

Category derived by content analyses	**frequency in the sample**
creates value to the customer and fulfills customer needs	8
creates value to the company	7
process innovation	4
product innovation	4
open innovation	3
disruptive innovation	2
innovation culture	2
something new	2
market success, implementation	2

The most frequently named aspect in the definition of innovation was the value creation for customers and the company. However, not innovative standard products and processes can also deliver such value. On a higher level of abstraction, one could argue that value creation is a prerequisite of a

successful implementation of an innovative product or process. According to the significant emphasis, this topic derived in the answers of the practitioners the author suggests incorporating the value creation explicitly into a general definition of innovation.

Product and process innovations were equally often referred to.

Categories found less often included open innovation or disruptive innovation aspects or stressed the importance of culture for innovation. Further aspects have been problem-solving and business model innovation.

As depicted in figure 4-1 over 80% or 13 participants of the sample stated that innovation is very important. One person stated it to be important and only two as moderately important. No one stated innovation to be only slightly important or not important.

Innovation is seen as the recipe for long term survival and has to be incorporated into a successful DNA of the company like one expert formulated: “Innovation is part of this DNA otherwise you would as a technically company not survive more than 125 years, so it’s very important” (I5 p. 1 line 29-31).

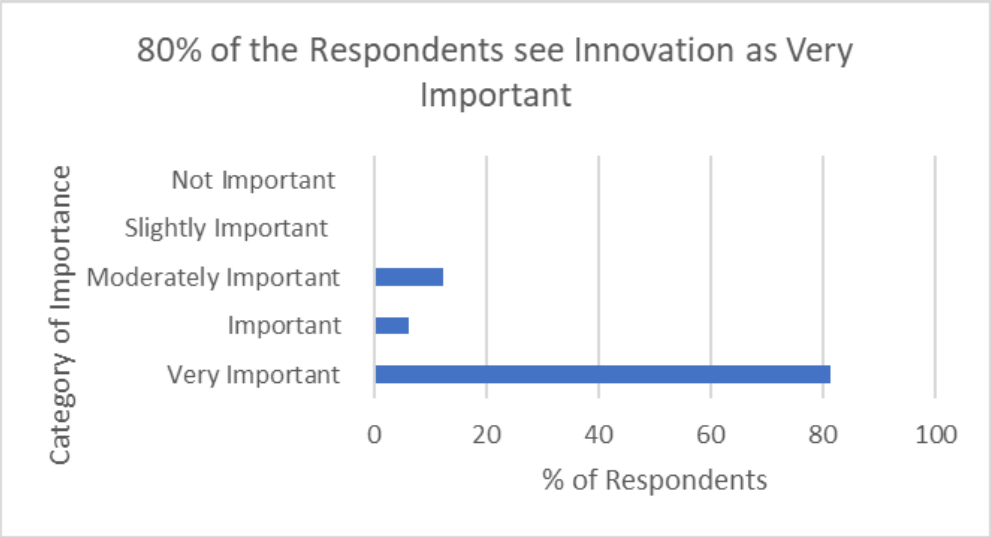


Figure 4-1 Importance of Innovation (Q2)

Although innovation is already seen as very important by most of the participants, all of them believe that it will become even more important in the next three years. No one stated that the importance of innovation would fall or strongly fall as shown in Figure 4-2. As many respondents thought that the importance of innovation would “*rise*” as stated that it would “*strongly rise*”.

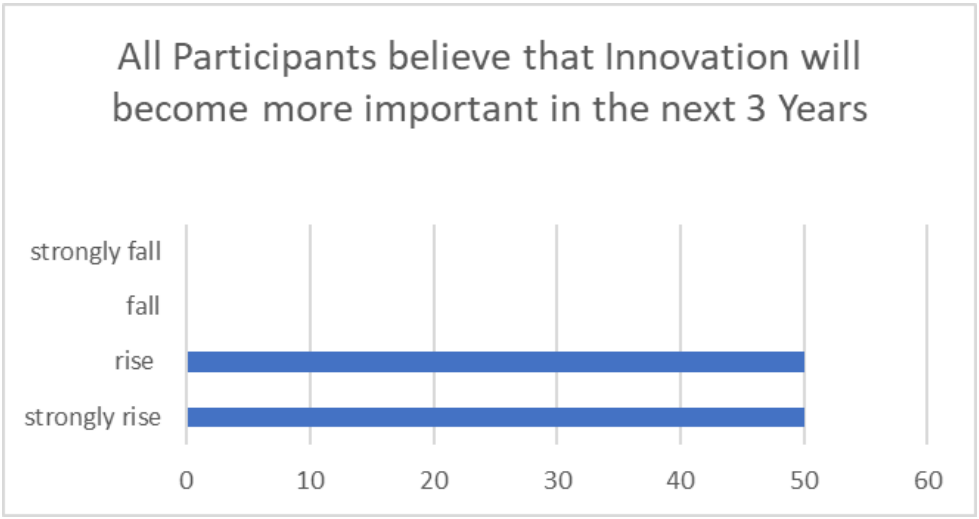


Figure 4-2 Future Importance of Innovation (Q2a)

As reasons for the high and rising importance of innovation, the following categories could be inductively distracted from the material:

- New market developments
- Changing demands of new generations of customers (Millennials)
- Push by smaller and more nimble companies and startups
- Lower entry barriers for new competitors due to new technologies
- Digitalization and disruptive technologies
- More complexity in a connected world
- Regulatory and tax changes
- An increased pace of change

The answers of the sample very much cover the drivers of innovation found by Goffin & Mitchell as quoted in the theoretical part of this master thesis (Goffin & Mitchell, 2017, p. 49) but add the emphasis on a higher speed of these changes and lower entry barriers as important drivers.

The **results** of the expert interviews **support the thesis number 2 that innovation has high and rising importance**.

As a result of the raising awareness of innovation on the C-Level of large corporations, the topic is often given more emphasis in the organizational structure of the companies as one interviewee stated when he said: “I changed to this kind of new role as chief innovation officer. […] Before I had the responsibility 80% taking care of building the operation, building processes, building a company and 20% maximum was reserved for innovation and two years ago we identified together, […] that we are now in the fourth industrial revolution, […] which is the next big change for us, the big change for the mindset and that we have to take care now a 100% for innovation” (I2 p.2 line 99-109).

Based on this finding, further studies could undermine the trends with lager statistically relevant samples. Further thesis and hypothesis could be derived and investigated in future studies. Questions like “Does the high and rising importance of innovation lead to organizational changes (i.e., the establishment of an innovation department) and will investments into innovation grow accordingly?” would be interesting and help to find new best practices.

4.3 Risk of Disruption and Investments in Different Forms of Innovation

The next relevant topic in innovation strategy (RQ1) covered by the qualitative study centers around one of the main drivers of innovation – the risk of being disrupted - and on the size and different forms of investment into innovation (T4). This section describes how likely the participants think their companies will be disrupted.

The participants were also asked how much of their companies’ revenues are invested into innovation (Q3), how much of these investments would go into internal innovation (R&D) and how much into open innovation (Q5) and how much they invest into incremental versus radical innovation (Q6).

The term *disruption* was used very loosely in the last years. Most people might define technology as disruptive, which has the potential to quickly substitute an existing product and service and replace it in the market. However, the concept first introduced 1997 by C. Christensen in his bestselling book “The innovator´s dilemma” (Christensen, 1997) had a particular meaning which is worth reviewing. In a recent review of their original work and the academic discussion in the years after its publication, the author complains that “Many researchers, writers, and consultants use “disruptive innovation” to describe any situation in which an industry is shaken up and previously successful incumbents stumble. But that’s much too broad a usage” (Christensen, Raynor, Rory, & McDonald, 2015, p. 4).

The original concept of disruption is not just a new technology which replaces an incumbent by a new entrance but “it seems that a disruptive technology is a specific type of technological change, which operates through a specific mechanism, and has specific consequences” (Danneels, 2004, p. 247).

The disruptive innovation, according to Christensen, has to be distinguished from sustaining technologies which “improve the performance of established products” (Christensen, 1997, p. XIX). Sustaining technologies can be incremental or more radical. “Occasionally, however, disruptive technologies emerge: innovations that result in *worse* product performance, at least in the near-term” (Christensen, 1997, p. XIX). Schmidt and Druehl summarize the concept as follows: “The new product (the disruptive innovation) is de-rated (it underperforms) with regard to the primary performance dimension most appreciated by mainstream customers of the old product. However, the new product may perform better on an alternate dimension and thus open up a new market (or may simply be easier to use or of lower cost). Then over time the disruptive innovation improves on the primary dimension to the extent that it eventually appeals to the very mainstream customers that initially

shunned it" (Schmidt & Druehl, 2008, p. 347). This special type of diffusion makes it so hard to spot for managers of incumbent companies and therefore so dangerous. Christensen stated that "it was disruptive technology that precipitated the leading firms´failure" (Christensen, 1997, p. XIX).

When asked how likely the 16 participants (see Figure 4-3) see their company be disrupted, none of them could exclude it, and only 4 saw it as rather unlikely. The majority saw it either possible, probable, very probable or even saw their company definitely being disrupted.

It shows that **the risk of being made redundant in the light of new competition and new technology is seen as high**. This is in tune with the studies of innovation consultants, which saw 41% of companies extremely or very at risk of disruption (CBinsights, 2018, p. 10).

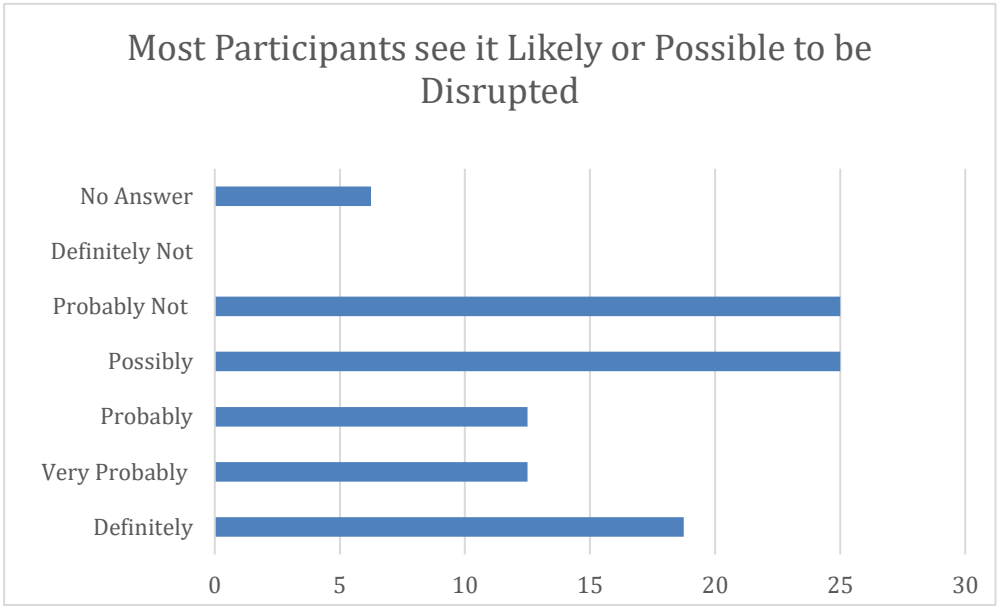


Figure 4-3 Perceived Risk of Getting Disrupted (Q5)

Literature, however, suggests some strategies to counter disruption. The most discussed responses to disruption seem to be (Goffin & Mitchell, 2017, p. 137f):

Finding an immediate application – typically in setting up a new organizational entity which can focus on developing the innovative technology and/or the innovative business model not being held back by the values and processes of the core entity. This seems especially applicable when the disruptive technology does not fit to the existing market but might suit new markets better.

Focus on existing business – in emphasizing and developing the strengths and features of the existing technology even further. This is suitable in case the disruptive technology cannot cover all the customer needs in the long run. The disruptive technology can then be kept at arm's length and will

coexist with (enhanced) forms of the traditional technology. Examples are the revival of shellacs and cinemas in the light of disruption by CDs or TV respectively.

Attack back and disrupt the disruption – this would mean that the incumbent not only emphasizes its strengths against the new entrant but changing their value proposition and business model to change the game again completely. A good example might be the Swiss watchmaker Swatch who moved to create well designed, simple, and cheap watches after the Swiss watch industry formerly based on expensive manual clockworks was disrupted by electronic quartz watches which were even more accurate than the traditional ones and cheaper.

Other authors suggest a strategy where the company follows a dual approach adopting the current business model to the altered marketplace and at the same time create a separate, disruptive business which shall develop the innovative solutions for the future growth (Sood & Tellis, 2011). The authors suggest sharing some resources and capabilities between the two entities. They "believe dual transformation will allow companies not just to survive the next disruptive challenge but to harness disruptions again and again to build enterprises that can thrive over the long haul" (Sood & Tellis, 2011, p. 73).

In the sample at hand Mayring´s content analyses reveals that in many cases, such a dual approach can be found (I5, I10, I12, I14). As one interviewee describes "there are certain areas where you could be disrupted, in others it's more difficult. It very often depends on capital-intensity; it very often depends on what things are changing" (I14 p3 line 144ff).

The '*disrupt the disruption'* approach could also be seen in the sample (I2, I4, I8). When asked about the risk of being dirsupted one participant claimed that at least for one of his business units "this is the other way around. We are the disruptor" (I10 p2 line 97).

A very interesting hint came from two respondents, which stated that the question would be answered differently depending on the time frame in which they looked at the risk of being disrupted (I1, I14). This could be used in future studies to gain more knowledge of how the risk is perceived given different timelines.

Another finding was that at least the interviewed banks were much less afraid of start-ups than of *"Big Tech"* like Google, Amazon or Aibaba as one respondent analyzed: "I think that the risk are not the startups. The risk is even more the huge companies, the huge international companies like Alibaba" (I7 p5. 237 ff) and that we might have to understand disruption not as a speedy event but as a process when he claims: "A revolution is […] easier, because you see your enemy, but it's a constant evolution" (I7 p5 267).

This goes well in line with more recent critical studies which try to demystify disruption and showed that although there is a hazard of disruption by low priced new technologies the emphasis of them coming from nimble startups might be exaggerated (Sood & Tellis, 2011). "Incumbents may take hope

from our results in that incumbents cause 50% of all technology disruptions and 62% of all firm disruptions" (Sood & Tellis, 2011, p. 352).

In the light of such a high risk of being disrupted, one would assume high and rising investments into innovation and a high percentage of those investments running into open innovation and especially into more radical innovation.

The question of how much of the revenues the company invests into innovation was hard to answer accurately by many of the participants. Four respondents or 25% of the sample could not answer this question. The main reason was the lack of a clear definition of what counts as an innovation in the company and the lack of a separate innovation budget. One common problem is how to attribute massive investments into innovative infrastructure which are part of the core business in industries like the telecommunication or energy. It is therefore questionable if one shall count the network modernization (5G rollout at the time of writing) in a telecommunications company into the innovation budget or not. If yes, the percentage of innovation compared to revenue might seem exaggerated if no, one does not respect the innovation character of rolling out a brand-new technology. Most of the respondents could give an answer and attribute their company to the categories given, but 7 of them stated some difficulties (I2, I5, I6, I7, I8, I9, I11). One respondent also mentioned that the budget on innovation is very much driven by the size and excitement of the opportunity when saying: "whenever there is a project that we see has a big potential or value to the company, I just need to knock the door of the board or the owner site and then I will get the money" (I2 p4 line 212). Consequently, the author assesses the results of this question with some reservations. What can be said is that most participating companies invest more than 5% of their revenues into innovation. Figure 4-4 shows how many participants invested which percentage of revenue.

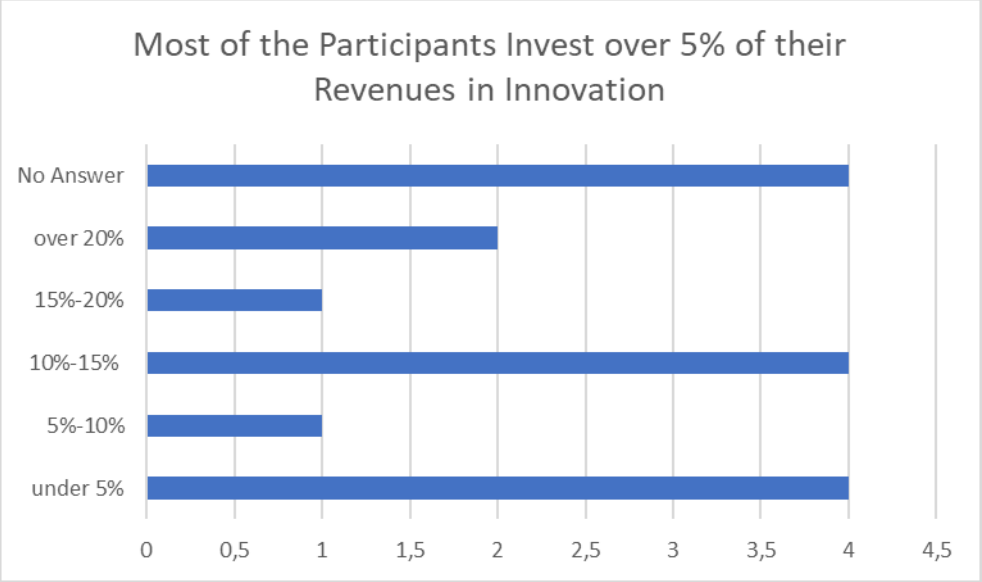


Figure 4-4 % of Revenues invested in Innovation (Q3)

There is little hope to be able to get more reliable figures on this critical question as even the innovation heads and CEOs of the companies could not give better numbers. Moreover, one can

assume that numbers will vary widely amongst industries as the statistical data on the differences in R&D spending in various industries provided by OECD suggest (OECD, 2017).

Clayton M. Christensen has already clearly understood the resource allocation problem in innovation. Only innovation proposals which get the funding and human resources they require have a chance for successful implementation. He writes: " One major reason for the difficulty of managing innovation is the complexity of managing the resource allocation process" (Christensen, 1997, p. 226).

The question of how well funded innovation is, is crucial, and one would suggest that with the rising importance of innovation, the budgets allocated to innovation would go up. Traditionally slow and well-considered budget allocation processes of large incumbent companies might not fit the fast-moving nature of innovation. To be successful traditional companies have to act like nimble entrepreneurs, and as one interviewee from a large international corporation put it: "When you are an entrepreneur and you see exactly now your chance to move the world forward, then you should do everything to get the budget […] So we need to speed up and speed up means take care and if there is a value, a potential, do everything to make it happen, also regarding the budget" (I2 page 4f line 221f)

The next question (Q4) reviewed in the expert interviews was how the total investments into innovation would split into internal or closed innovation vs. open innovation. It shows that in the sample on average more than one-third of the investments already run into open innovation (see Figure 4-5). This is in line with other recent studies which found that 51% of the innovations happen internally, 31% via partnerships and only 18% were bought from external sources (CBinsights, 2018, p. 25).

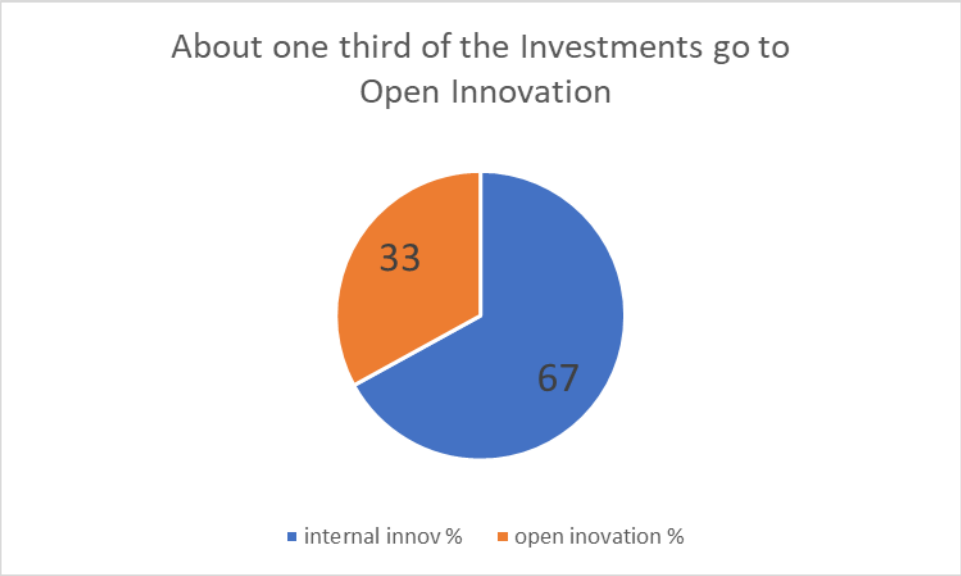


Figure 4-5 Ratio of Investments Between Open and Closed Innovation (Q4)

Seeing innovation becoming more and more essential and disruption at the gates, the study at hand also investigated how much incumbent companies invest in incremental innovation vs. more radical ideas.

The distinction between incremental and radical innovation is commonsense, but it can be structured around the degrees and dimensions of innovation. In classic economic literature, this was first and most prominently done by Igor Ansoff in his work on diversification 1957, which is quoted in many strategy and marketing books up to today. Ansoff´s matrix describes four basic strategies which can be structured on the two axes, first markets (existing, new) and second products (existing, new) (Ansoff, 1957, p. 114). Later research added risk levels to the original matrix (Richardson & Evans, 2007, p. 2). In the most recent literature and studies, this theory could be adopted and made fertile for innovation management (Nagji & Tuff, 2012). As shown in figure 4-6, in their innovation ambition matrix, B. Nagji and G. Tuff distinguish three levels of innovation from core to adjacent to transformational innovations.

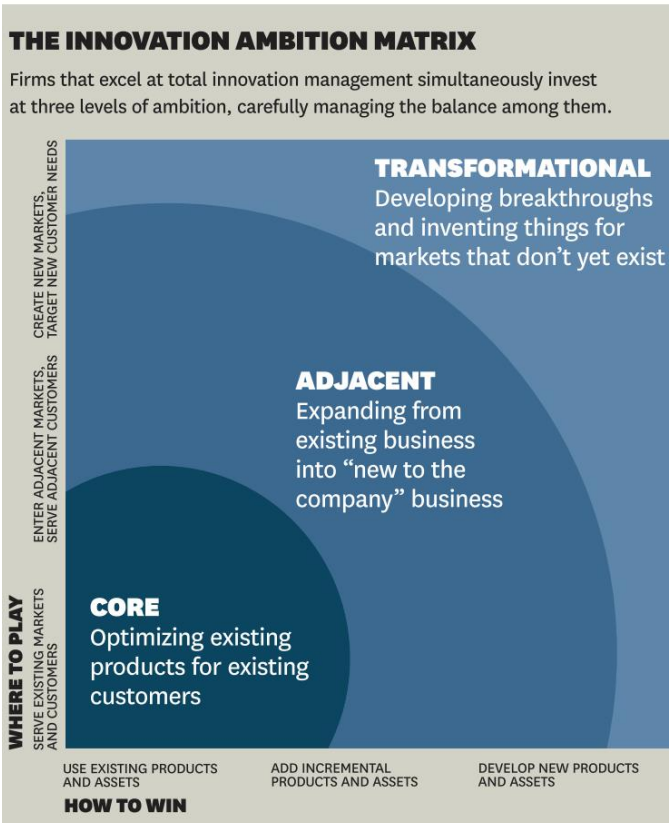


Figure 4-6 The Innovation Ambition Matrix (Nagji & Tuff, 2012, p. 69)

The authors not only suggest a classification of innovation ambitions into three classes but also analyzed whether a special distribution between those yielded a better performance reflected in the share price. Their findings support the thesis that there is a golden ratio as " Companies that allocated about 70% of their innovation activity to core initiatives, 20% to adjacent ones, and 10% to transformational ones outperformed their peers, typically realizing a P/E premium of 10% to 20%" (Nagji & Tuff, 2012, p. 70). According to their studies, an inverse ratio seems to apply to the returns of innovation, meaning that 70% of the returns come from transformational and only 10% from core innovations. Even though the study suggests a golden ratio, the authors acknowledge that the right ratio might vary by industry, competitive position, and the stage of a company's development.

Very much in line with the studies quoted above the study at hand revealed that most of the investment money in the sample goes into incremental improvements while less than 30% flowing into radical innovations. This can be seen in figure 4-7. **This supports thesis number 4 that although companies see a risk of being disrupted, they invest only a small proportion of their budget in radical innovation.**

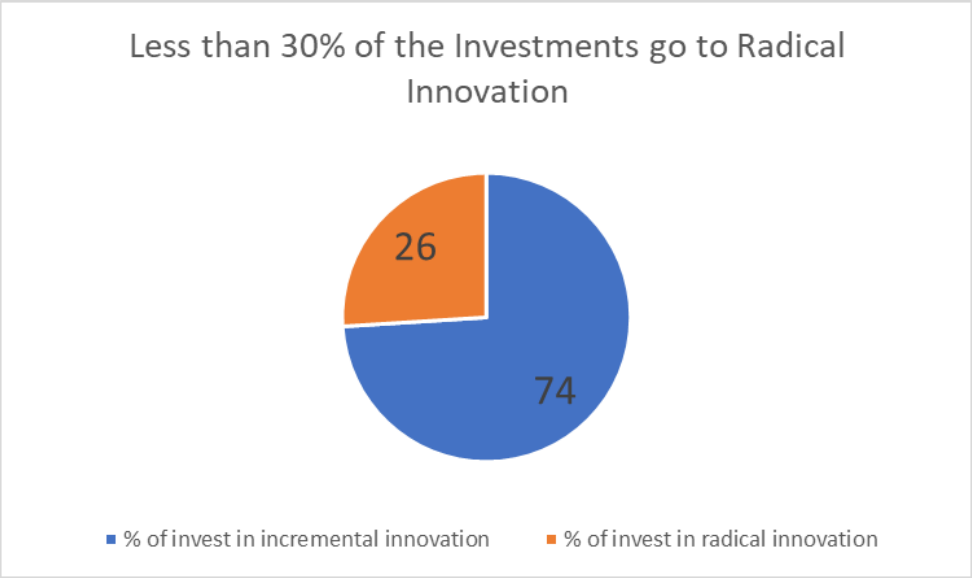


Figure 4-7 Split of Investments Between Incremental and Radical Innovation (Q6)

This might be one of the reasons why incumbents rarely disrupt their industry and come up with radically different approaches for value creation. Although one expert gave an example on how an incumbent could well defend itself and become disruptive taking a radical process innovation approach when describing: "I would say that agile transformation of the organization is radical. Just think about hundreds of people being like you know reorganized from being the traditional chart like units or departments and then we turn them into like squads and chapters and thrives. So, I would call it a radical innovation" (I1 p 2f line 108ff).

The fact that most returns come from more radical innovation as described by Nagji and Turf can also explain the high risk-reward supported by other recent studies (CBinsights, 2018, p. 17)

4.4 Level of Professionalism in the Innovation Process

As demonstrated in the previous sections, innovation is perceived as very important and as getting even more critical in the future. Depending on the industry and on what organizations count as innovation, most companies in the sample invest significantly more than 5% into innovation. As the boundaries of the companies are too narrow to provide with enough internal innovation, on average one-third of all innovation investments already goes into open innovation. About one-quarter of the investments seem to be dedicated to finding more radical ideas which help companies shield from disruption or enable them to disrupt their industry themselves.

This section shall analyze how professional the corporate world is dealing with innovation. Do large corporates have clearly structured innovation processes (RQ2) and if yes, how can they be described (Q7a)? Can best practices be distilled?

When asked if they follow a clear innovation process (Q7) about one-third of the interviewed companies admitted that they do not do so. Two thirds, however, claimed to follow a clear process.

Subsequently, the respondents who claimed to have a clear innovation process were asked to describe their innovation process more in detail (Q7a).

To analyze their answers, Mayring's deductive category assignment methodology was applied (Philippe Mayring, 2014, p. 95ff). To assess the professionality of the described innovation processes, three levels of professionalism could be differentiated:

- The highly professional innovation process
- The medium professional innovation process
- The poorly professionalized innovation process

After defining these categories, appropriate anchor samples were found in the material, and clear coding rules were established and documented (see Appendix 4). The coding rules were then applied back to the interview material to find how many of the interviews could be attributed to the categories.

A highly professional innovation process has been assumed when the participant could describe at least two of the following criteria:

- clear steps in the process and/or
- roles involved and/or
- methods/tools applied

Medium professionality was assumed when only one of the criteria could be named and poor professionality when in the description, none of the criteria got mentioned.

The finding was that about one-third of the sample seems to have highly professional innovation processes while the rest is either mediocre or weak or have no clear innovation process at all.

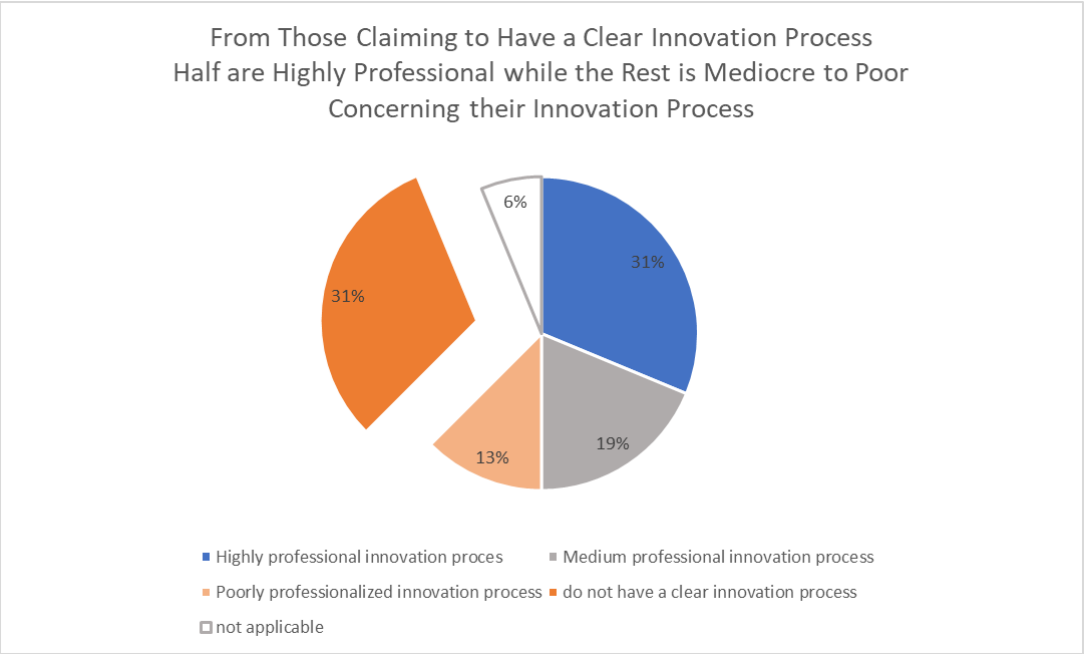


Figure 4-8 Level of Professionalism of Respondents Claiming to Have a Clear Innovation Process (Q7a)

Despite 69% of the sample claim to have a clear innovation process – deeper analyses of their reports showed that only half of that group could concisely describe their processes and the other half can only describe one or none of the features of a highly professional innovation process. This points in the direction of some social desirability effects when answering if a company has a clear innovation process. Social desirability effects are "When people tell you what they think will make them look good, especially according to prevailing standards of behavior and thought" (Bernard, 2013, p. 205). The effect was foreseen by the author, and therefore, the participants were asked to describe their innovation process in detail after claiming to have a clearly defined one.

The findings of no, mediocre, or poor innovation processes in the empirical study at hand go well in line with the studies quoted in chapter 1.2.4 of this master thesis, which found a lack of professionalism. However, qualitative research also revealed that at least one-third of the sample had highly professional innovation processes. The reason could be found in the size and special selection of the sample, but it is also possible that due to the rapid development of the area an increasing number of large companies improved their innovation processes since last year when most of those studies were published. More longitudinal studies on this matter would be helpful to clarify this.

Looking at the interviews of the participants with highly professional innovation processes, some best practices could be filtered out.

In one example, the innovation department provides the framework and the platform for innovation but always works in conjunction with the product departments. The company established a professional in-house acceleration program to attract and scout startups. It engages all employees also those in remote branches to share their ideas via a contest supported by a home-grown software tool which is used across all regions and departments. The innovation manager proudly states, "since we

have this innovation contest, really everyone can submit their ideas and it will be looked at, it will be evaluated" (I1 p3 line 147). When the idea or startup is selected, the innovation department provides highly skilled project managers to support the implementation (I1 125ff).

The process of Red Bull Media House (thanks to RBMH for the permission to name the company in this context) can be described as another best practice example. RBMH follow a very crisp innovation process - as shown in figure 4-9 - which includes three main phases

- Scout
- Check
- Make it happen

Figure 4-9 Red Bull MH Innovation process (with friendly permission of RBMH)

The scouting phase in RBMH is very open and includes internal and external sources. To stimulate the creative ideas of employees so-called "*Jam Sessions*" are held. Like a good band leader, the moderator helps the participants to achieve a harmonious and target oriented collaboration often using gadgets (like toy blocks to stimulate creativity). Then the check phase includes testing (as shown in Figure 4-10), adjusting, and prototyping in a Scrum-like fashion (Takeuchi & Nonaka, 1986). In the end, budgets get approved, and market ready products get developed.

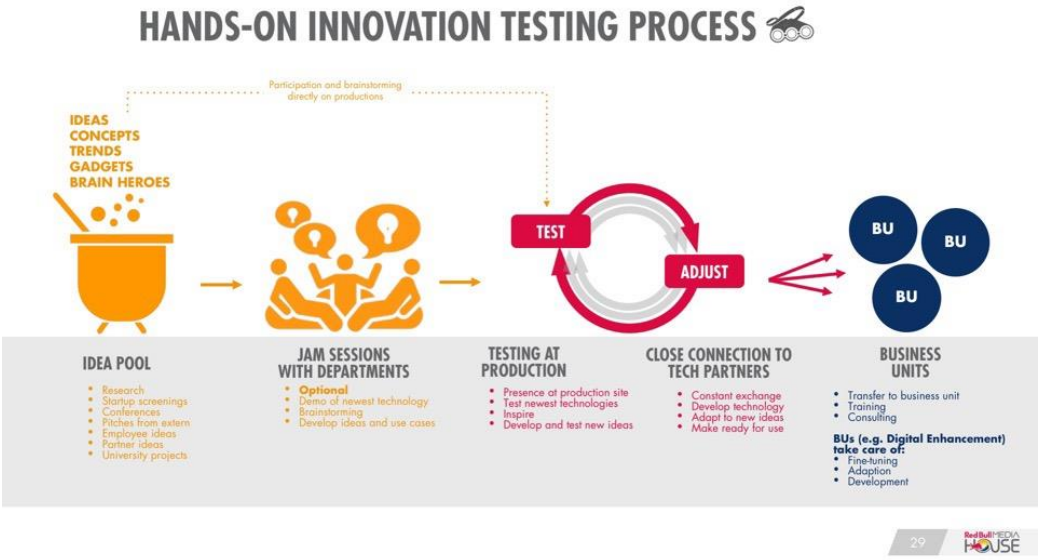


Figure 4-10 Red Bull MH Innovation Testing Process (with friendly permission of RBMH)

Another company emphasized the use of mentor teams to support the pre-selected startups in the co-creation phase (I7 p6 line 317ff).

To have trend scouting as part of long-term (five years), medium-term (three years) and short-term (6-months) innovation planning was the strength of yet another company in the sample (I10 p3 line 117ff).

A very clear collaborative startup selection and decision-making process in a so-called "*Innovation Panel*" stood out in the expert interview with a large multinational company where the decision criteria for selecting innovation were described as follows: "Does it make us unique, does it make us admirable by our customers and give us an innovative lead and does it make us successful in terms of cash out" (I14 p4 196ff).

Concluding - the often-quoted lack of professionalism in the innovation processes seems stunning, given the high and rising relevance of innovation. However, this study revealed a different picture. There seems to be not one ideal innovation process that fits all, but the processes are highly customized to fit the specific needs of the organization at hand. This was expressed by the large variety and depth of answers in the expert interviews. In the examples given by the interviewees, a lot of interesting best practices could be found. Companies which openly admitted that they had no clear innovation process established yet reported to work on creating one at the time of this study. One interviewee stated: "This is a project we are working on. How could we design the innovation process? How could we establish processes? This is the main task of this group working on that" (I13 p3 line 150ff). This is an indication that the main reason for innovation processes still being weak is the novelty of innovation management as a discipline of science and practice. As the first studies on innovation

processes being published now almost a year ago, the results of this study might be interpreted as already showing an improvement.

The **thesis number 5 that companies do not follow a clear innovation process - cannot be fully supported by this study.** Whereas this might be true for some companies in the sample, an equally large number already reported well elaborated and tailor-made innovation processes. The assumption is that at least more substantial companies are quickly improving and structuring the innovation processes according to their individual needs. More extensive and more longitudinal studies could shed light onto the question. It must be asked if innovation processes professionalize in the speed and to the degree which must be assumed when looking at the importance and dynamic of the topic.

Given that most companies still have room to improve their innovation processes, the study at hand tried to widen the understanding which steps in the process are perceived as most important and which are most challenging to master.

As a framework to differentiate innovation processes, the innovation pentathlon contributed by K. Goffin and R. Mitchell was utilized (Goffin & Mitchell, 2017, p. 29). As described in Section 2.2.2. the framework differentiates the following five tasks in the innovation process:

1. Creating an Innovation Strategy
2. Finding Ideas (in open innovation scouting for startups)
3. Selecting the right ideas/startups
4. Implementing the right ideas/startups
5. Putting the right people, culture, and organization in place to facilitate innovation

The experts were asked to rate each of these steps according to their importance on a Likert scale from very important to not important (Q9). After that, the experts were asked to rate the same steps on the difficulty to be mastered excellently (Q10). The Likert scale ranging from very easy to very difficult.

As it can be seen from the Figure 4-11 all steps are perceived as very important or important by most of the participants. Everyone in the sample saw people, culture, and organization as very important. Strategy was judged as being very important by 12 out of 16 experts. Selection was rated very important by 11 out of 16 experts. Nobody saw any of the steps in the innovation process as not important, and only one person mentioned the implementation phase as being only slightly important.

This **supports thesis number 3 that open innovation and especially scouting and the selection of startups is seen as important**. After having analyzed the results, however, it gets transparent that also other stages in the open-innovation process are perceived as very important.

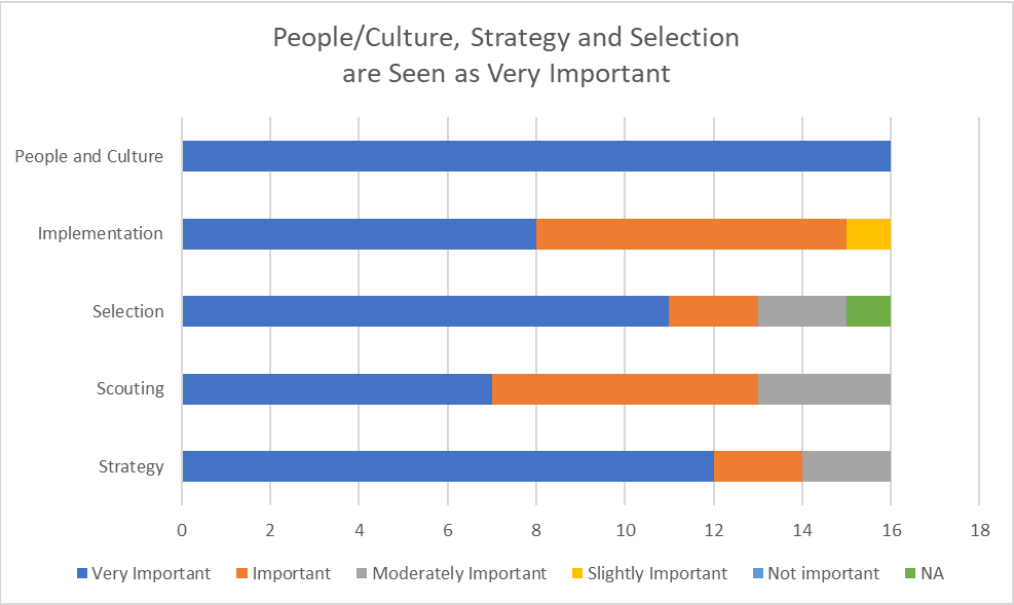


Figure 4-11 Importance of Different Steps in the Innovation Process (Q9)

The question of how difficult it is to master the steps in the innovation process gives a more differentiated picture.

As depicted in figure 4-12, each step is seen as difficult by some participants but as easy by others. In total, the tasks are described as rather harsh to master as interviewees used the rating very difficult or difficult 33 times, whereas they used very easy or easy only 22 times.

The areas reported to be most difficult to master by the respondents were people, culture and organization, and the implementation of new ideas. Nine managers rate it very difficult or difficult to find the right people, culture, and organization for innovation, whereas only four thought this would be easy and three rated it average. Nobody rated it to be very easy. The implementation is seen as very difficult or difficult by ten managers, as easy by only two and as average by four. Nobody rated it to be very easy. As one respondent put it: "The problem is the execution. A lot of good ideas, good strategies, good plans, but we have a problem at […] executing" (I13 p4 line 202f). Another top manager emphasized the role of the management to get the people and culture right when saying: "it's also the task of the management to get the people, to get the right mindset, to get the right attitude. That's super important, otherwise you're not changing a company" (I14 p5 line 235ff).

Strategy seems to be bipolar. Five respondents saw it very easy or easy, five average and five difficult or very difficult with one participant giving no answer. Similar but somewhat less extreme, the selection phase was named six times easy, five times average and five times difficult. Scouting was seen one time very easy, four times easy and seven times average and four times difficult.

The results of the qualitative study at hand **support the thesis number 6 which indicates that it is hard to perform well in important steps of the innovation process** and gives some indication which steps in the process seem to be most problematic.

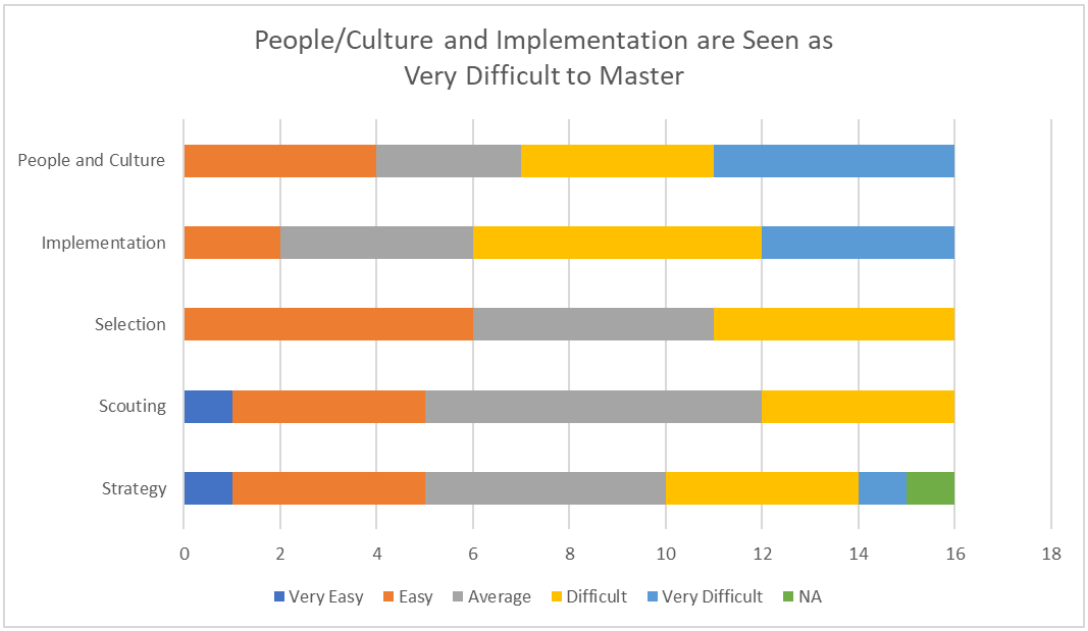


Figure 4-12 Difficulty to Master Different Steps in the Innovation Process (Q10)

That people and culture are amongst the main difficulties in innovation is also supported by a recent study by S. Kirsner which analyzed the biggest obstacles to innovation amongst 270 leaders in large companies (Kirsner, 2018). According to the study, the number one obstacle named by more than 55% of the respondents have been politics, turf wars, and lousy alignment. To mitigate this risk, the author suggests senior leaders to: "be clear about what the innovation or new ventures group is expected to do, and how others are expected to support it" (Kirsner, 2018, p. 5). The number two obstacle is cultural issues which might be addressed by creating innovation-friendly subcultures, new kinds of incentives, and bringing in new and more diverse talent. The number three obstacle is the inability to act on critical signals. It is not so much about knowing about future trends and developments or knowing about disruptive startups but to act upon it.

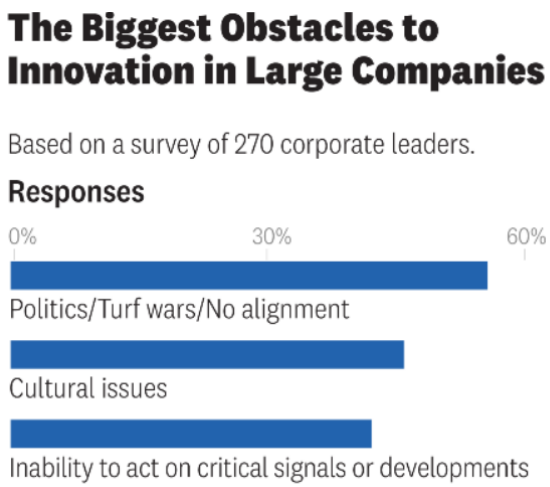


Figure 4-13 Top Three Obstacles to Innovation in Large Companies (Kirsner, 2018, p. 4)

When it comes to cooperation between large corporates and startups in open innovation, there are some challenges which may cause the relatively low success rate of 44% (Berthon, Jusserand, & Medland, 2016, p. 3).

The World Economic Forum (World Economic Forum, 2018) names some common challenges for both startups and corporates when they collaborate as depicted in Figure 4-14.

Figure 4-14 Challenges for Startups and Corporates in Open Innovation (World Economic Forum, 2018, p. 10)

These challenges might hinder the excellent implementation of a solution and require appropriate management of people, culture, and organization of both corporates and startups. Some of these problems could also be found in the expert interviews for this master thesis. One large ICT company reported problems with the not-invented-here syndrome when saying: "If there is a good idea some people are reluctant to accept someone else found the good idea. That is something where we face difficulties and sometimes need to push people to accept" (I14 p6 line 311).

It is evident that in the collaboration of startups with large corporations, a significant gap in culture must be bridged. In their study on "Harnessing the Power of Entrepreneurs to Open Innovation" the management consultant Accenture names an imbalance in the perceived commitment, the gap in culture and a lack of government support as main challenges for successful open innovation projects of large corporates around the globe (Accenture, 2015). The cultural differences between corporates and startups are listed in Figure 4-15.

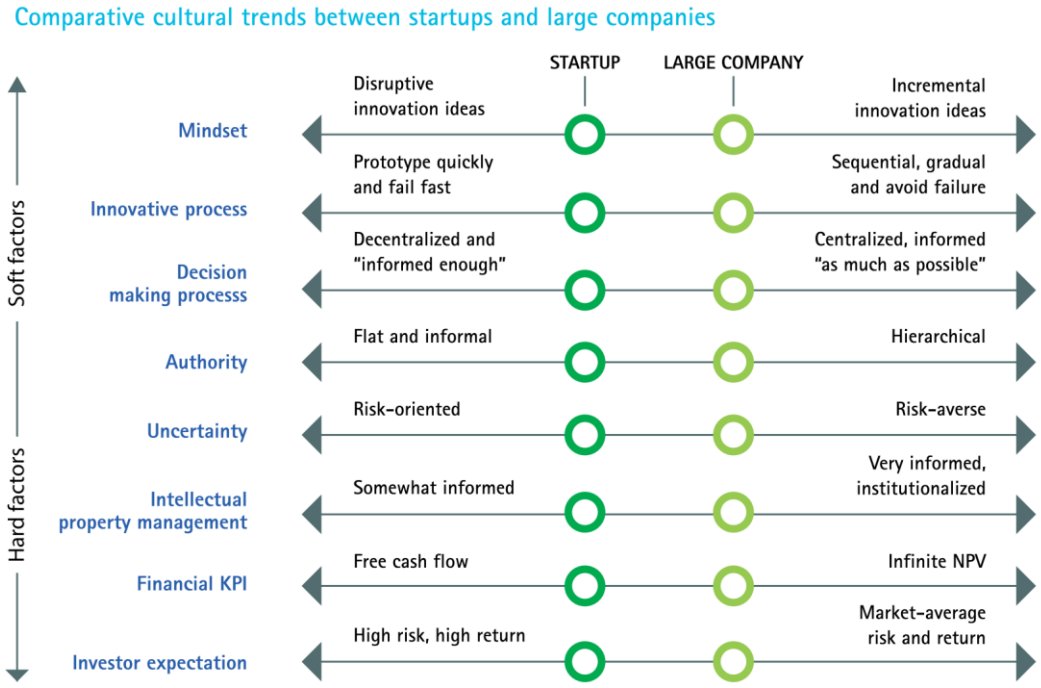


Figure 4-15 Cultural Gaps Between Startups and Large Companies (Accenture, 2015, p. 9)

In this section, the author could show that while some companies still do not follow a clear innovation process, some are already very professional in their approach to innovation.

Some best practices could be filtered out and described in more detail.

Whereas all steps in the innovation process are perceived as very important, or some steps were called very difficult to master.

Especially the implementation phase is seen as difficult, and the management of people, culture, and organization in the (open-)innovation is a big challenge. Some hints from recent innovation literature, and studies on the root causes of these challenges and possible mitigations were discussed.

This can give indications on how to further professionalize and improve innovation processes and avoid common pitfalls.

4.5 Searching/Scouting for Startups

As the author could show in previous chapters, innovation is seen as ever more critical and about one-third of the innovation budgets are already dedicated to open innovation. Therefore, the question of how and where to find and select the right startups becomes vital (RQ3).

Over 80% of the experts interviewed for this master thesis rated the scouting phase as being very important or important. Approximately one-third of the respondents reported scouting to be difficult, one third as average and one third as easy to manage.

The question which instruments the companies used when scouting startups was first investigated by asking an open question (Q11). The material was analyzed using Mayring´s inductive category formulation. The categories derived from the material were then applied back to the text, and the number of mentioning's was counted. Figure 4-16 shows which scouting sources have been mentioned most often.

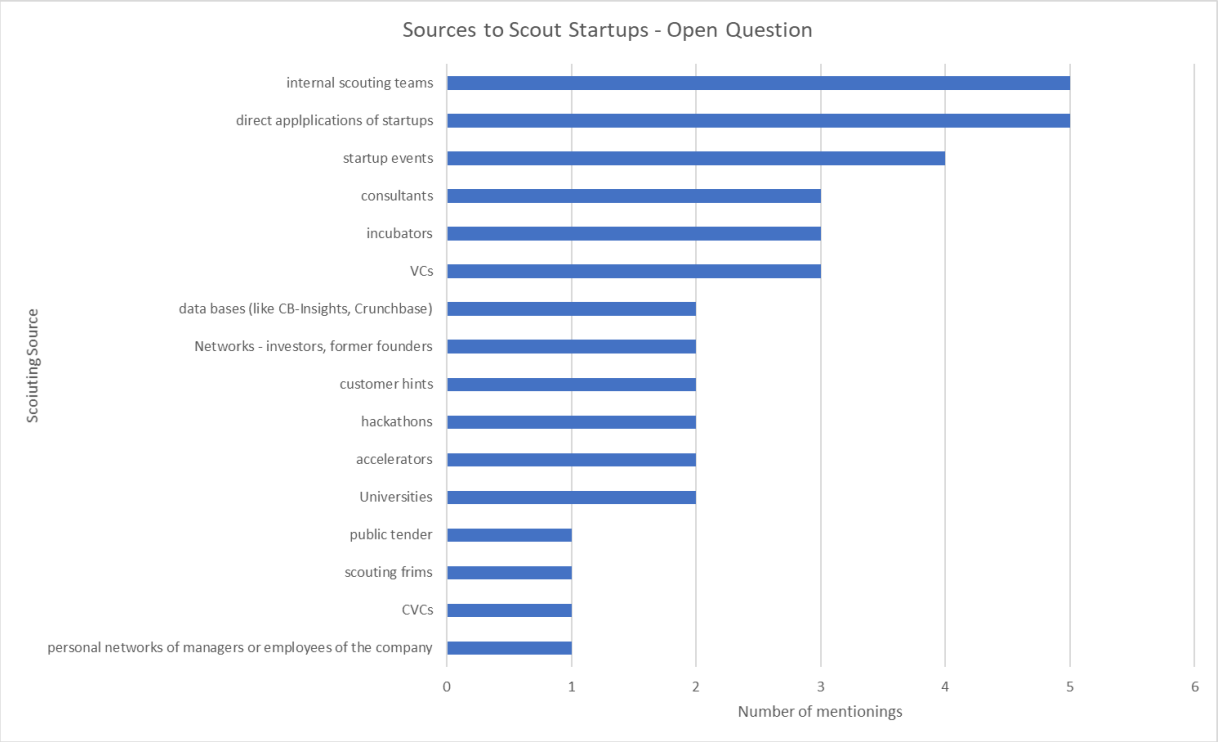


Figure 4-16 Sources to Scout Startups - Result of Open Question (Q11)

The results indicate that an essential source of startup deal flow comes from internal staff. As the CInO of a large multinational company put it "So, whenever there is an idea in a country which could fit to our company ideas then they call us. And therefore, finding startups doesn't mean that I need to activate or exclusively find scouts and give them a job. The whole organization is always in this listening mode, scouting mode" (I2 p9 line 486ff)

Another often overlooked source for finding startups are unsolicited applications. This can make up to one-third of the deal flow as one expert mentioned "from startups approaching us which is probably a third of the startups coming in. […] Another third is through our social networks. So, we try to proactively build and maintain networks with other investors, with founder of our startups, with former founders. […] the third is really we go out to outbound, we research industries or product areas and approach startups, we go to events, to pitching competitions" (I11 p4 line 200ff).

The two sources unsolicited application and nomination from the internal network of employees were mainly named by large multinational companies with strong brands. As the manager of a well-known brand and world market leader reported: "we've got offices in many countries and so it's about activating our teams to engage and identify startups, that's one. Two is we work with partner

organizations whether they are accelerators, incubators or venture fonds to identify the right startups for us. And then three we organize events, say similar to hackathons […] where startups actually participate in trying to solve problems and then we are able to identify and find innovative startups that way" (I4 p3 line 114ff).

Smaller companies with weaker branding might have more difficulties to get enough deal flow from these sources. Two companies (I7, I12) complained that they would not necessarily get the best startups because they might be outperformed by larger competitors with more corporate venture capital or stronger branding. Startups apply where they get the most reward in terms of CVC money; sales reach, know-how, or reputation. The war for talents is also applied to the startup world.

Further sources, which were on the top of the minds of many respondents were startup events, consultants, incubators, and venture capital firms. Very interestingly databases like Crunchbase and CB-Insights got mentioned several times also.

Learning from the answers, personal networks of managers and employees and networks of former founders or investors should not be neglected.

To learn more about which sources are used most frequently and about the innovation managers perception of their effectiveness, a list with possible sources to find startups was presented (Q12). The interview partners were asked to indicate which instruments their companies use and to rank them on their effectiveness. The respondents were encouraged to supplement the list by sources they use, and which were not covered by the original list.

Figure 4-17 shows which scouting sources were used by most of the respondents in the sample. It shows that universities are used by almost all participants even though they are not top of the mind as they got only rarely named in the open question. Entrepreneurship events are attended by most companies and innovation labs, in-house incubators, as well as hackathons, are also very popular.

Most companies used multiple scouting sources at one time. In **average, six different scouting sources were used**.

Most respondents also gave some rating on effectiveness. If counted how often a scouting source was rated amongst the top three solutions for each company, some differences to the usage can be seen. Universities are not only used most often but also seen as the most effective way to scout startups. To host an entrepreneurship event was perceived as equally effective even though used by only nearly half the corporations in the sample. To attend entrepreneurship events and to run innovation labs, use corporate venture capital, in-house accelerators and management consultants were also frequently rated high in effectiveness.

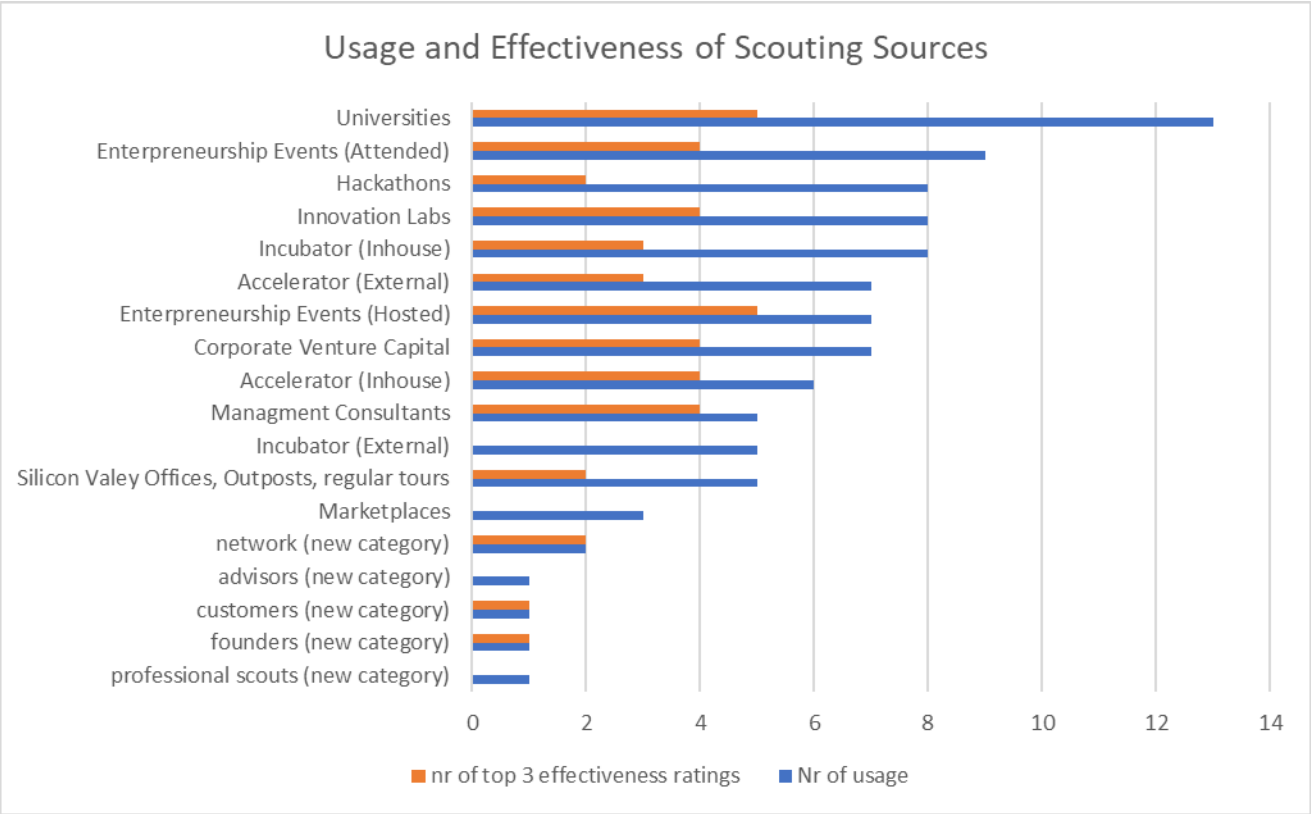


Figure 4-17 Scouting Sources - Usage and Effectiveness (Q12)

Summarizing, it can be said that scouting for startups has become an essential function of innovation management. Most companies use multiple sources to look for new exciting startups to cooperate with or to invest in.

The **thesis number 7 that companies know and use only a few of the possible instruments for scouting startups was not confirmed in the sample** at hand. On the contrary, it showed that most companies already use a larger number (on average six) sources to search startups. Most companies are well informed about the possible sources and apply them depending on their strategy or resources available.

Larger multinational companies with market-leading brands seem to have the advantage to receive a large deal flow of startups from unsolicited applications and their international staff. Smaller companies might lack that advantage. As there is almost no literature on startup scouting, best practices can only be insufficiently described. More studies and quantitative studies would be required to test the hypothesis derived from the qualitative study at hand.

Most companies in the sample were found to work with universities and attend entrepreneurship events. Both sources are also perceived as effective.

There was some evidence that also very recently developed software-platforms are already used as scouting sources.

4.6 Startup Selection

As described in Section 4.5, companies use multiple sources to find startups. But how successful are they with their scouting activities (RQ3)? To answer that question, the experts participating in this master thesis were asked how many startups they get visible each year (Q13a) and how many of those they would evaluate more in detail (Q13b).

The average number of scouted startups per company interviewed was 759 per year (see Table 4-2). The numbers of scouted startups range from zero to 4.000. There was a group of approximately one-third of companies who scouted over 1.000, one third who scouted between 100 and 1.000 and one third who scouted below 100 startups each year.

From the average number of 759 startups which companies got visible, they evaluated slightly more than 100 or 14% more in detail.

69% of all respondents have seen startup selection as very important, and over 80% as very important or important. Selection scored even slightly higher in importance than the scouting phase. Approximately one-third of the participants rated startup selection as being difficult, one-third as average and one-third as being easy.

As analyzed in previous chapters, the startup selection process is still very poorly described and investigated (Cui et al., 2012). This might be attributed to the novelty of this problem for practitioners as open innovation and startup selection only recently became standard practice in most larger organizations. With more startup events, accelerators, incubators, and larger innovation departments, the deal flow of startups increased substantially, and so the bottleneck in open innovation moved from scouting to the selection and implementation of startups.

Recent research found that less than 25% of startup pilots result into successful market implementations and that only slightly more than one-quarter of companies do more than ten pilots with startups each year (YOUNIS et al., 2017, p. 25).

The study at hand found that from all startups scouted on average, only 1,2% could successfully be implemented. Implementation included any successful market implementation or M&A activity. While 0,7% of all startups scouted were involved in a pilot or M&A but failed in the end. In average, the companies in the sample had nine successful startup implementations each year and suffered five failures.

Consequently, the **thesis number 8** from the literature study **that companies only successfully implement solutions of a very small fraction of all the startups they analyze was confirmed by the sample** at hand.

There might be a natural threshold concerning the number of startup pilots even larger companies can cope with. Each pilot requires attention and collaboration with multiple departments as well as the top management of the corporation. This can only be managed for a limited number of startup partners. Further studies would be welcome to understand more closely how the integration efforts can be managed most efficiently.

Some companies also mentioned that it is equally essential to abandon derailed startup partnerships than it is to start new ones. One expert emphasized this when saying "It´s easier to start even than to quit and this is a very important process to stop partnerships as well […] if they don't comply to a concrete plan because otherwise you are carrying along and everybody gets frustrated" (I3 p6 line 262).

Table 4-2 Nr. of (Un-)successful Startup Implementations Compared to Nr. of Startups Scouted and Evaluated (Q13a, Q13b, Q14)

Interview Nr.	Number of Startups Scouted each Year	Number of Startups Evaluated each Year	Number of Sucessful Implementations	Number of Unsuccessful Implementations
I1	4.000	400	40	5
I14	2.000	50	8	0
I15	2.000	300	5	2
I9	1.000	250	25	10
I12	1.000	50	1	1
I3	500	200	26	23
I4	400	20	4	5
I11	400	200	3	2
I8	300	na	10	5
I5	250	80	5	20
I7	150	50	3	1
I6	50	7	3	2
I10	50	10	3	1
I16	30	20	10	5
I2	10	3	1	1
I13	-	-	0	0
Summ	12.140	1.640	147	83
average	**759**	**109**	**9**	**5**
N	16	15	16	16

Given the high number of startups scouted and the small number of (possible) implementations, the selection problem gets more and more vital in today's innovation departments.

Questions of selection methodology and selection criteria must be solved.

75% of all respondents claimed to have a clear selection methodology, whereas 25% admit they do not. This indicates that **the sample did not confirm the thesis number 9 from the literature review that companies do not have a clear selection method.**

The group which claimed to apply a clear selection methodology was then asked to describe it more in detail. Applying Mayring's inductive category formation (Philippe Mayring, 2014, p. 79) groups which emphasize different methodologies could be distinguished (see Figure 4-18 Startup Selection Methods).

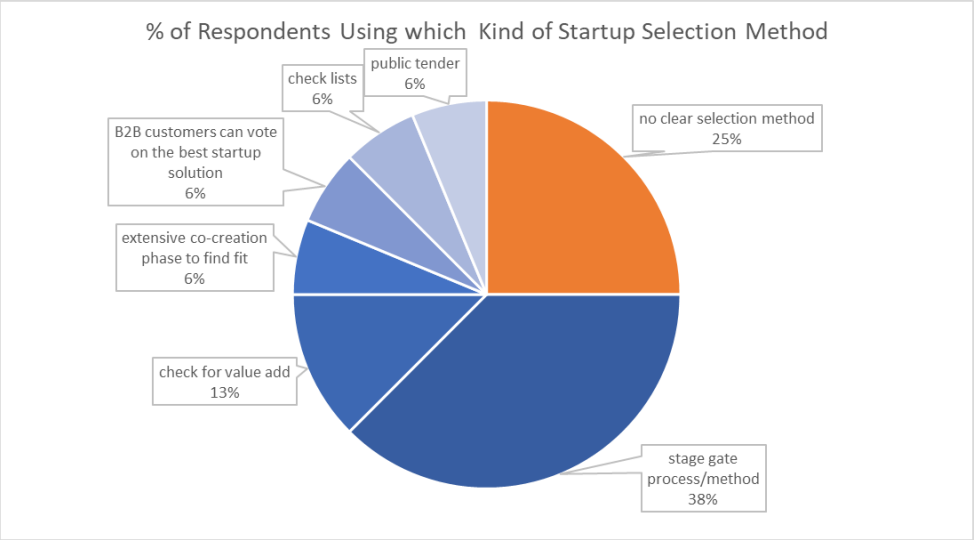


Figure 4-18 Startup Selection Methods (Q15a, Q15b)

The most common approach found in the sample was the stage-gate approach. This means that the startup must pass several gates to get considered.

In some cases, the first gate is to apply some knock out criteria depending on the strategy of the company. This can be financial or legal criteria (I3 p6 line 274) or size, maturity stage of the company, the investment it already received or is asking for, the topic or product it offers and if it has a proper team (I11 p6 line 318f). This very much depends on the (innovation-)strategy of the company. The next steps very often include the evaluation of the material and videos provided by the startup. Some research on the potential market or the competition might be undertaken by the corporation. Then there might be a video call, or a personal meeting is arranged. Often the short list is created after that. In most cases the final decision then is taken by a board or other group of experts. In the last phase, term sheets or other legal contracts are negotiated and finally closed.

Given the learning and experiences from this qualitative research, the author suggests a typical stage gate process (see Figure 4-19) which can be modified according to the strategic and organizational needs of the company.

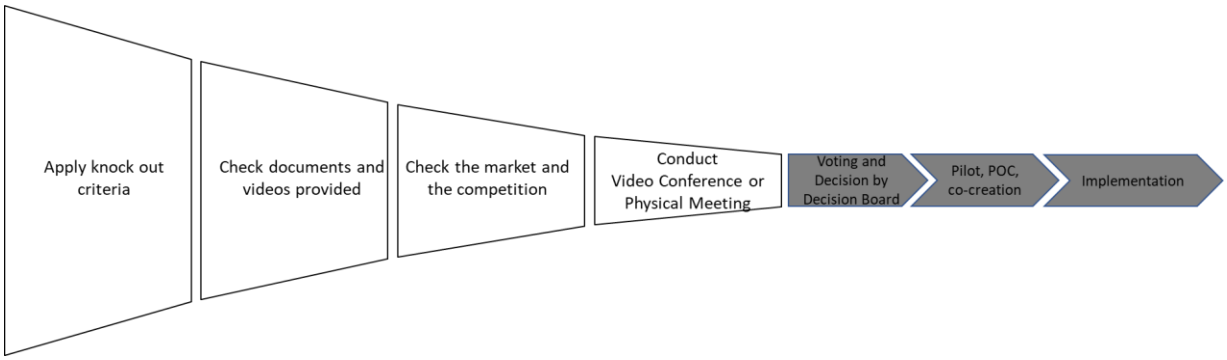


Figure 4-19 Typical Stage Gate Startup Selection Process

Another method was to apply checks for the value add of the startup. The value-add of the startup could be evaluated against the internal processes and potential cost savings or the value add it can create for the end customers of the company (I4 p3 line 153, I5 p5 line 274).

There were also cases which oppose the classical pitch or stage-gate approach, and which focus much more on the co-creation process with the startup to select the right one. As one respondent put it: "Our selection methodology is based on spend time with these guys, offer them a possibility to show their idea in very intensive way […] We give them a chance to play with us like in sports, so do a training with us for some weeks or months" (I2 p11 line 580ff).

A very interesting method to select startups is to let the customers of the company doing the selection and vote for their preferred startups. This can be organized in innovation events hosted by the company where a pre-selection of startups is invited and presented to many (potential) customers. The method can be used to create a short list or to directly vote for a startup to enter an acceleration program by the company. The final decision could be taken by a jury where again customers can be included. This method, of course, is more feasible in a business to business settings.

Simple checklist approaches can also be applied.

Last, but not least, it is to mention that public companies especially can be very much restricted in the creativity of their startup selection method, as they must stick to public tender processes which are not always very well suited to address the nimble startup selection requirements.

Financial selection methods were never explicitly named as being applied for selecting startups. If mentioned, then as applicable for selecting later stage companies (I3 p6 274). Therefore, the **thesis number 10** derived from the literature review **that non-financial methods play a more important role than financial methods could be confirmed by the sample.**

The next open question was on which criteria were used in the startup selection process (Q16a). Applying Mayring´s inductive category formulation eight categories as depicted in the figure 4-20 could be extracted.

The quality of the founder's team and their commitment was most often mentioned as top startup selection criterium. A typical statement given brings it to the point: "You can have a great idea, you can have a great vision but when there is no human vibration there is no human fit, if you see there is no mentality match you will lose. So be really focused on the people" (I2 p11 line 597ff). Some other respondents stressed the necessity of the founder's team to rally have their stakes in the new idea and to take some financial risks and others emphasized the congenial qualities such a team must provide.

The next frequently mentioned criterium was the strategic or cultural fit. As one respondent put it:" I would definitely say the strategic fit, the leadership and the technical capabilities are most important" (I2 p7 line 309). Other experts also emphasized that the startup must not be in direct competition with the company.

The maturity stage of the startup is also a very important selection criterium. Some companies explicitly only go for more mature partners, while others are also interested in early-stage startups.

An excellent product and original idea are also frequently mentioned. One respondent stated: "I think there are two main criteria for me which would be crucial for the decision. The one is: What is the idea? The business idea, the product, the service, how is the fit with my business and would it be interesting to push also our business, or could it help to improve? And the other criterium is the person: Who is it? The founder, the people who make it" (I13 p5 line 262).

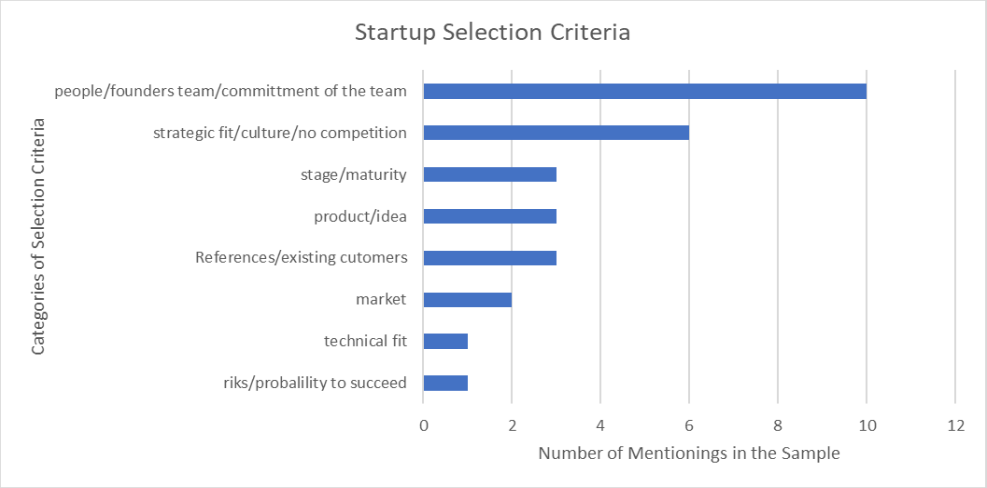


Figure 4-20 Startup Selection Criteria - Number of Mentioning's - Open Question (Q16a)

As an additional question (Q16b), the experts were asked to rank the criteria derived from literature and shown them as a list. The respondents were able to add criteria as the list was explicitly not presented as being complete. Product and cultural fit were added in this way as new categories. The results of this question are shown in Figure 4-21.

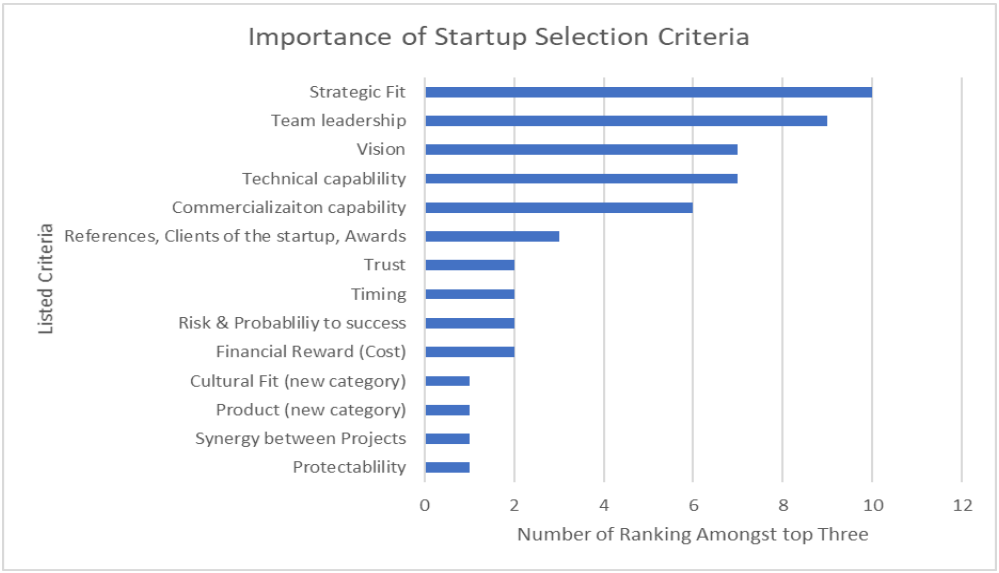


Figure 4-21 Importance of Startup Selection Criteria - Top 3 Ranking from List (Q16b)

It shows that the closed question produced widely consistent results with the open question. Strategic fit and team leadership were most often mentioned among the top three selection criteria. The criteria stage and maturity were missing in the list but were revealed as important criteria in the content analyses. These criteria might be especially important for investors, but large corporates also named them as being important.

The vision of the founding team the technical and commercialization capabilities of the new company was also frequently ranked among the top three criteria used by the experts.

References and existing clients were named in the open question and ranked high when presented in a list of criteria. On the first glance choosing references as a criterium to evaluate startups might seem somewhat counterintuitive, as especially early-stage startups might just have a good idea and maybe a prototype but no customer references yet. However, there is a lot at stake for the corporations, and they can get some references from people who had first experiences with the team even when there is no finished customer project done.

To conclude the **thesis number 11 that some universally important selection criteria can be found is supported** by this qualitative study. Of course, more quantitative research would be required to prove that this holds true for larger populations. The hypothesis is that the entrepreneurial quality of the founder team and the strategic fit are good selection criteria to predict the future success of cooperation or investment into a startup. To test this, further studies need to be conducted.

The next questions centered around who is and who shall be involved in the startup selection process.

In average, the sample companies involved slightly more than seven departments in the startup selection process. **This supports the thesis number 12 that multiple departments are involved in the selection of startups.** This fits the results of a study in 100 global corporations where the authors found up to ten departments involved in startup partnerships (YOUNIS et al., 2017, p. 19). This was seen as

critical because of the extensive coordination effort and the long time needed (YOUNIS et al., 2017, p. 6).

The departments most often mentioned to be involved in the startup selection process are business development and corporate innovation as shown in Figure 4-22. Marketing and legal also got involved frequently. Procurement, sales, strategy, and technology experts also got mentioned but less frequently.

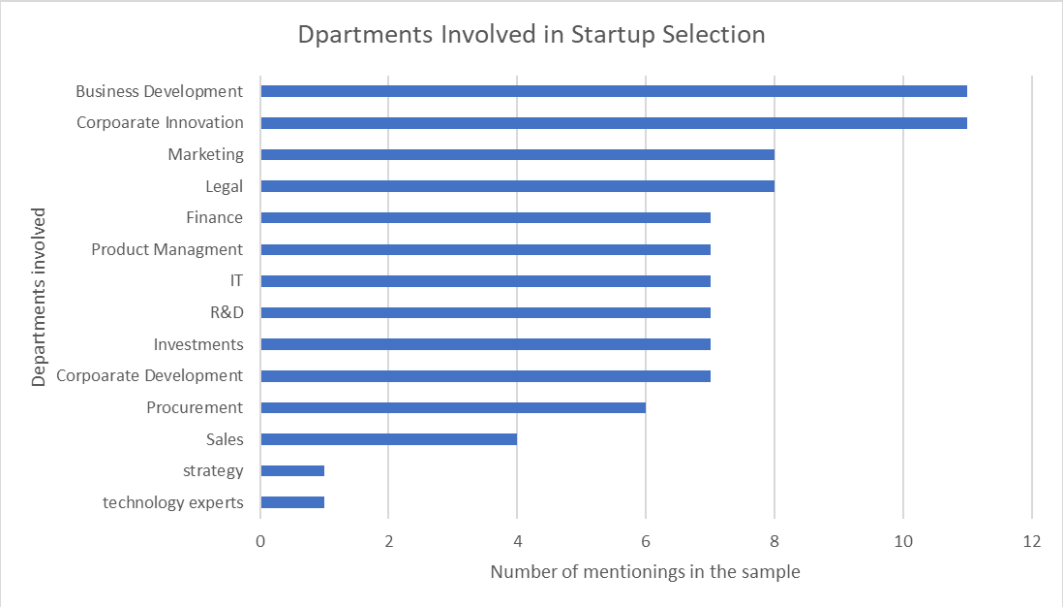


Figure 4-22 Departments Involved in Startup Selection (Q17b)

When asked about the hierarchy level of the departments involved in startup selection, it shows in figure 4-32 that innovation is mostly dealt with on higher hierarchy levels. This was especially true for the corporate innovation and IT departments, which the respondents reported being involved only on C-level and SVP/VP level. The departments legal, procurement, and R&D however, were predominately represented on director and associate levels.

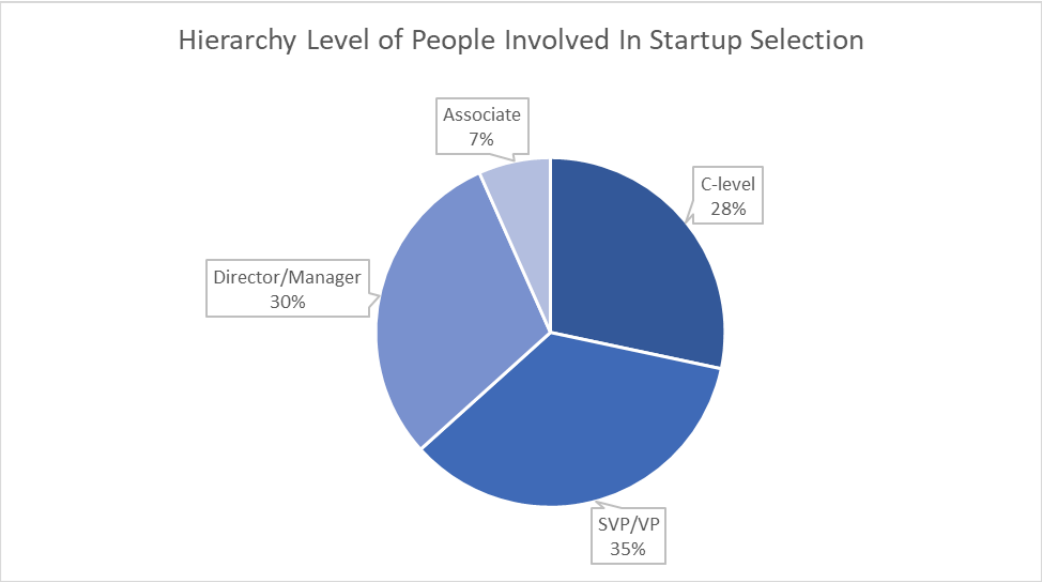


Figure 4-23 Hierarchy Level of Representatives of Departments Involved in Startup Selection (Q17b)

The next questions centered around the involvement of external experts in the startup selection.

Two in three companies in the sample already include external experts in their startup selection process (as seen in Figure 4-24). These companies benefit from the expertise and the unbiased outside view of these experts.

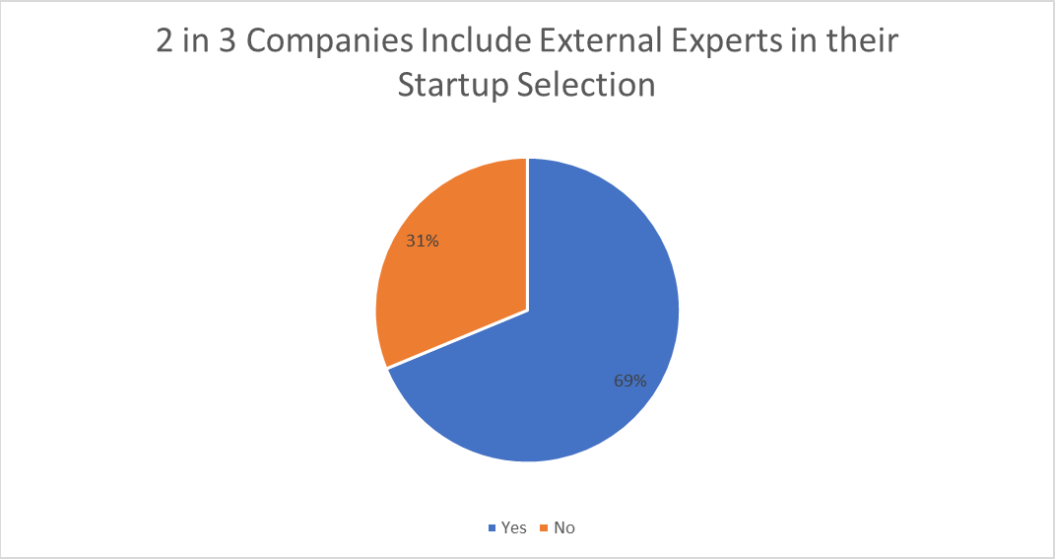


Figure 4-24 Percentage of Companies Using External Experts in their Startup Selection (Q18)

From those companies who do not use external experts in the startup selection process, only one company did explicitly deny doing so in the future. This company explained it by focusing on their own business when reasoning: “That´s not our value chain. We talked about this in many other aspects in the company but know-how and skills to sell that on other companies, but we decided no we focus on our own business” (I3 p8 366). The other companies could well conceive to include external experts in future startups evaluation projects.

The study at hand also investigated which experts had the best reputation in supporting startup selection projects. A list of possible professional backgrounds or institutions of external experts was given to the participants with the question to rank them on how helpful they are in the startup selection process (Q20). The respondents could also add further categories. The results indicate a mixed picture (see Figure 4-25).

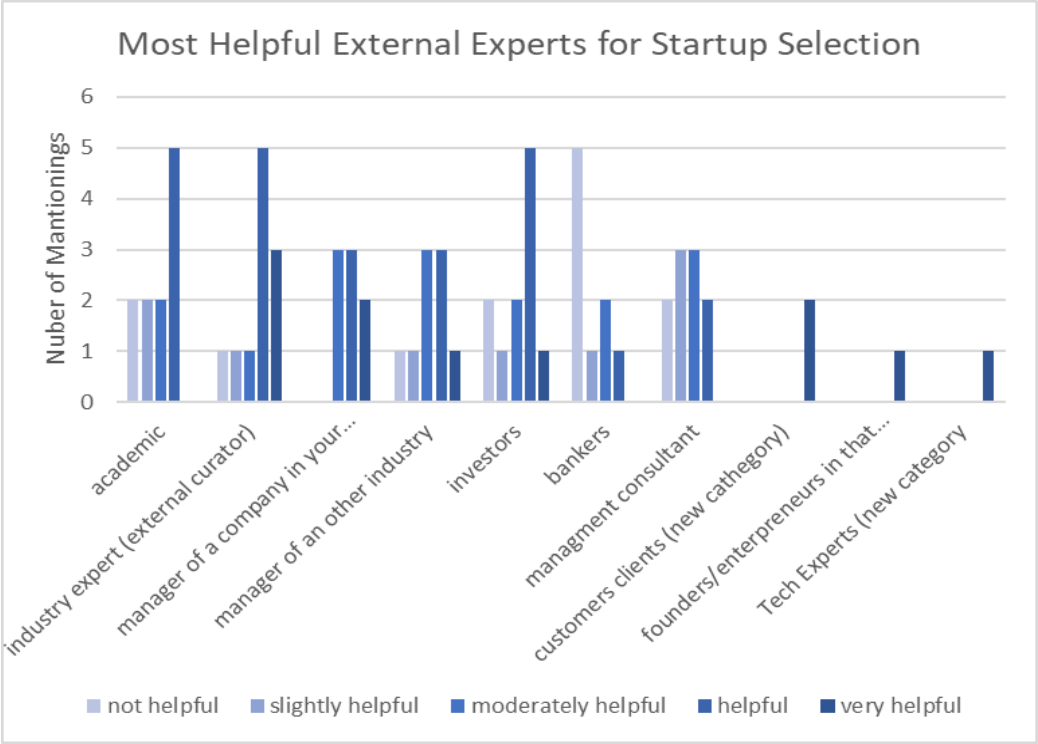


Figure 4-25 Helpfulness of Different External Experts in the Startup Selection (Q20)

Some experts were seen entirely or predominately positive. This is true for managers coming from the same industry, industry experts, customers, founders/entrepreneurs in the same industry or tech experts. Other expert groups were perceived ambiguously or critically. Academics were perceived as helpful by five companies either two saw them only moderately or slightly helpful, and two even found them useless at all. Bankers were rejected most often, and management consultants had a mixed rating.

The sample showed a great willingness to act as a curator and help other companies to select startups as shown in Figure 4-26. Over 80% of the respondents would offer their service as a curator, and only 20% denied.

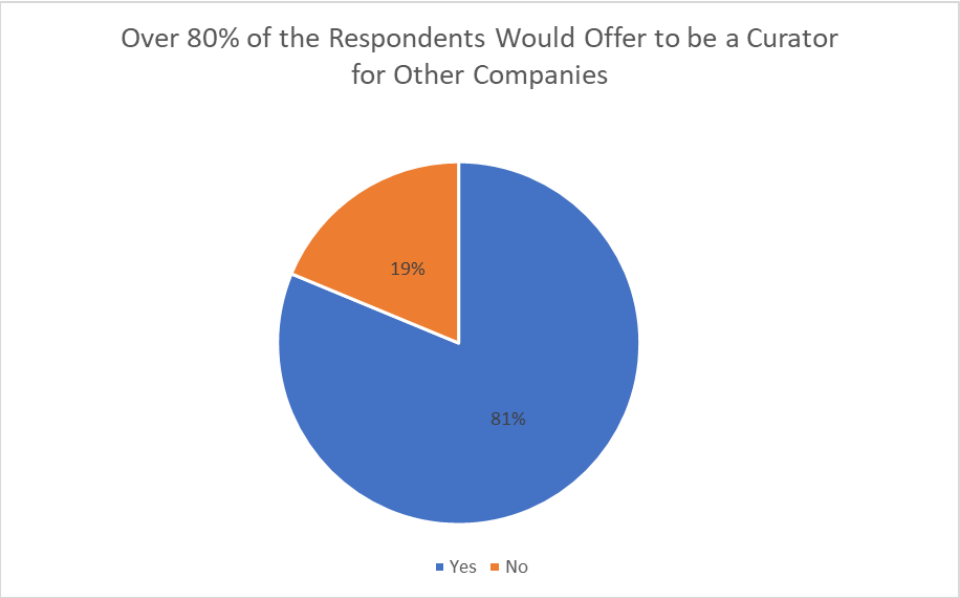


Figure 4-26 % of Respondents who Offer to Act as a Curator for Other Companies (Q21)

The fact that most companies already involve or plan to involve external experts in their startup selection process and the fact that most of the managers interviewed are willing to act as curators for other companies **supports thesis number 13 that there is a need for external help in the startup selection process.** This study also gives some indication who shall be involved, and which potential curators are perceived as being helpful or not.

4.7 Usage and Future of Innovation Management Software

This study also investigated which software is used in the innovation process (Q22) and which software functionality was eventually missing (Q23) to excel in that task (RQ6).

In the given sample, it shows that most companies already support the innovation processes with specialized software tools. Only four companies or 25% of the sample did not use specialized innovation management tools. On average more than two tools were applied in the field of innovation (which also includes some standard office tools like Google Forms or WhatsApp).

Homegrown innovation and idea management tools which cover internal or closed innovation and can be used to store, filter, and evaluate ideas were most commonly used. These kinds of solutions were named by almost half of the companies. Although proprietary solutions were mentioned frequently, none of the market-leading packaged solutions as described in more detail in Section 2.5 of this master thesis was used by the companies in this sample.

The picture is different when looking at the very recently available packaged software solutions for startup scouting and selection. Here some of the leading new tools were already in use by the participating companies. Crunchbase and F6s are examples. As expected, many other smaller tools were also mentioned as the market is still very fragmented.

The table 4-3 gives an overview of the SW tools, which were named in the sample and describes their core functionality.

Table 4-3 Innovation Management Tools Used in the Sample (Q22)

Tools beeing used	Homepage	Short Description	Frequency
Idea Plattfrom	often taylor made mainly for idea management not startup selection	proprietary application	7
non	non	non	4
Salesforce	https://www.salesforce.com	Salesforce is a cloud-based customer relationship management (CRM) platform that interacts with customers — including marketing, sales, commerce, service, and	2
Crunchbase	https://www.crunchbase.com	platform for professionals to discover innovative companies, connect with the people behind them and check the investments made in startups	2
Jira	https://www.atlassian.com/software	Jira is used for issue tracking and agile project management	2
F6S	https://www.f6s.com/	open innovation management plattform to scout and select startups	1
WhatsApp	https://www.whatsapp.com	easy to use instant message program	1
slack	https://slack.com	Slack is an American cloud-based set of proprietary team collaboration tools and services	1
Trello	https://trello.com/en	Trello is a web-based list-making application used to organize and prioritize projects	1
switch pitch	https://switchpitch.com	enterprise startup relationship management (SRM) platform attracted an impressive group of investors	1
KITE	https://www.getkite.co	open innovation managment plattform to map, monitor and manage outside innovation – from discovery and evaluation, to selection and management	1
Venture Scanner	https://www.venturescanner.com	startup research platform	1
Factset	https://www.factset.com	SW to support the investment process from idea generation, research, portfolio construction, trade execution, performance measurement, risk management, reporting, and portfolio analysis	1
Sigma SW	https://sigma.software	sprovides software development, graphic design, testing, and support services for large corporates and startups	1
mindminers	https://mindminers.com/en/	digital solutions for idea screening, market research, product and price definition	1
pipedrive	https://www.pipedrive.com	CRM tool designed to help small sales teams manage intricate or lengthy sales processes	1
Fundtech	https://www.finastra.com	CRM tool designed for investors	1
Google Forms, Google docs	https://www.google.com/forms	administration app that is included in the Google Drive office suite along with Google Docs, Google Sheets, and Google Slides. Forms features all of the collaboration and sharing features found in Docs, Sheets, and	1
traction	https://www.mytractiontools.com	software centralizes on Level 10™ Meeting Tools, Weekly To-Dos, Scorecard Measurables, Executing Your Vision	1
pitchbook	https://pitchbook.com	data, research and technology covering the private capital markets, including venture capital, private equity and M&A transactions	1

The participants of the study at hand were also asked to indicate which functionality they miss in their current tools and which functionality they would wish from an ideal software tool in the future (Q23). Applying Mayring's inductive category formation (Philippe Mayring, 2014, p. 79) some crucial categories for the development of innovation management software tools could be extracted. The ideal software tool for innovation management shall incorporate the following features and functions.

Functionality like registration for startups/ideas, scouting, filter, selection, validation, and survey functionality seem to be standard already. However, more information on solutions, technology, and capabilities of startups would be expected. The ideal tool: "would probably be a tool that provides a little bit more inside into the start-up's solutions and technology platform and capabilities" (I4 p4 line205).

Artificial Intelligence (AI) to structure the collaboration output, and to assist the matchmaking by calculating the fit between the corporates or investors strategy and the applicant's attributes was named frequently as a needed future enhancement. One respondent summarized this when saying: "At the end, we would love to have artificial intelligence assisted or supported system who is picking out all the relevant stuff and structure it" (I2 p14 line788).

Future tools need to provide an excellent user experience (UX) and an intuitive user Interface (UI) which shall be oriented on very easy to use and very user-friendly consumer applications. The leader of a large corporation using multiple tools complained: "Especially most of this B-to-B softwares need to think of: How can I make this that people actually want to look at it [...] Most of the B-to-B software is a UI disaster" (I3 p9 line417ff).

The need for an even stronger collaborative functionality was mentioned by many participants in the study (I3 p9, I7 p10, I8 p11).

Enhanced knowledge management and the possibility to build standardized business cases in the tool were also mentioned as important criteria in the future. Notably respondents coming from a financial background claimed: "You need at least a scoring, you need, what we always wish would be to create a business case in this tool for us. This would be the main criteria. And also the strategic fit" (I5 p6 line 326).

Project and Portfolio Management also have been named as future fields of improvement (I16 p10, I6 p7).

Last not least, the need to combine tools for internal and external, closed and open innovation into a unified solution was formulated when finally stating: "I think that the troubling part currently is that we have various tools in order to go into the decision-making process" (I14 p10f line 566f).

With this input, a model of an ideal unified innovation management software platform can be developed. The author suggests a model for such a future innovation management platform, as depicted in the Figure 4-27.

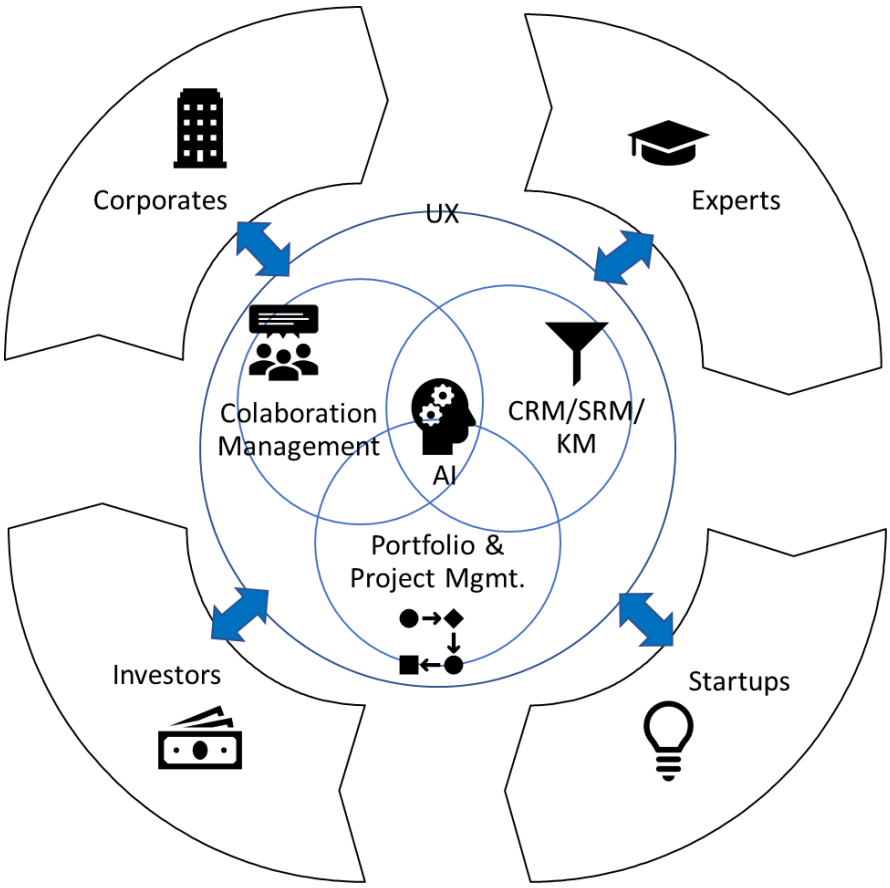


Figure 4-27 Model of an Innovation Management Platform of the Future (Q23)

A successful innovation management platform needs to cater for four central target groups:

- The corporates who are interested in new ideas and in innovative startups to build a fertile pipeline for their open innovation program
- The experts who can contribute as curators and help to vet and evaluate the ideas
- The startups who search for investment and potential corporate customers as co-creators and often need corporate sales channels to grow successfully. Startups also need a lot of professional serves and external know-how to thrive.
- Last not least, the investors who can be VCs, CVCs, or family offices and who search for exciting investment opportunities and scout, evaluate and manage a broad pipeline of potential startup targets.

The business model of such an innovation platform is based on attracting as many startups and new business ideas as possible. The incentives for startups are that they will find investors and corporates for common projects on the platform. To attract as many startups as possible, it needs to be free to apply for each startup to participate. There shall even be special incentives and gamification aspects for the startup to keep their data up to date. In the case of employees, there need to be career and financial incentives to participate and insert their ideas. The investors and corporates, however, will be happy to pay for the services of such an innovation platform in the form of software license or service fees. Curators will have to be paid by the corporates and by the investors.

The software functionality of the innovation platform shall allow for internal innovation (idea management) and external innovation (startup application) and use common but customizable matching and vetting algorithms and AI tools. It needs to be based on simple and easy to use UX, with easy application processes and strong collaborative tools to include instant messaging and video. Startup-relationship functionality shall allow managing a large pipeline of startups and ideas through a funnel comparably with customer projects in a sales process. Knowledge management could be supported by integrating existing trend scouting platforms or specialized news channels via open APIs. Portfolio Management functionality shall enable the corporate or investment companies to decide on the right idea and startup portfolio based on decisions of their innovation strategy. Customizable selection criteria for internal and external curators shall be included. Strategic decisions shall at a minimum include decisions on the degree of incremental vs. disruptive, open vs. closed innovation, the desired maturity stage of the startups/ideas, and the field of technology. The core of the system shall be a strong AI which will continuously improve a learning matching algorithm and eliminate inherent irrational biases of the users.

As it can be seen in the analyses above, some of these functionalities are already provided by the existing vendors, whereas there is still much room for improvement. As network effects are inherent in such an innovation platform, there will foreseeably be a consolidation in the market, and only a few dominant players will survive. It is highly speculative who those vendors will be and if they will develop out of the existing innovation management software vendors or the new startup selection software players or emerge from large tech giants who already dominate part of the innovation ecosystem with other solutions.

In summary, the **thesis number 14 that there is a need for a platform which assists the open innovation and startup selection process was confirmed by the sample**.

4.8 Conclusion

In the previous sections, the theoretical findings and the (hypo-)thesis were confronted with the views and assessments of the experts who took part in this study.

The findings were explained and amended by drawing on the latest studies and literature on the topics which surfaced in the interviews.

From the 14 theses which were tested in the interviews, 11 could be supported by the findings of this study. The study could not confirm three theses (number 5, 7,9). The fact that innovation processes were more professional, scouting instruments better known, and selection methods more diffused as assumed in recent literature, might be accounted to the fast development of the topic driven by the practitioners and less by academics.

The table 4-4 summarizes the results found in the empirical part of this study. It gives an overview of how the six research questions and the 14 theses link to the results and whether a thesis could be supported by the findings or not. Page numbers shall help the reader to quickly navigate to the location in the text where each of the 14 (hypo-)theses are finally evaluated.

Table 4-4 Summary of empirical part - Link of RQ to Thesis to Main Findings

Research Question	RQ Nr	(Hypo-)thesis	Thesis Nr	Thesis supported not supported by the findings	Main Findings	Page
How does innovation strategy support the selection of startups?	1	There is no consitent definition of innovation	1	supported	practicioners most frequently mention value creation for customers and for the company	84
How does innovation strategy support the selection of startups?	1	Innovation has a high and rising strategic importance	2	supported	80% see innovation as very important all believe that the imporants will (stronlgly) rise	86
How does innovation strategy support the selection of startups?	1	Open innovation especially the scouting and selecting of startups are important	3	supported	participating companies invest more than 5% of their revenues into innovation in the sample on average more than one-third of the investments already run into open innovation almost all steps in the open-innovation process were rated as (very) important	98
How does innovation strategy support the selection of startups?	1	Although companies see the risk of being disrupted, they invest only a small proportion of their budget in radical innovation	4	supported	most companies see it possible or likely to be disrupted less than 30% of the budget goes into radical innovations	93
Do companies follow a clear innovation process to support startup selection?	2	Companies do not follow a clear innovation process	5	not supported	more differentiated picture - at least one third of the companies have highly professional processes already many best practices could be found	98
Do companies follow a clear innovation process to support startup selection?	2	It is hard to perfrom well in important steps of the innovation process	6	supported	it was seen most difficult to handle people, culture and organization, and the implementation	99
Where do companies find the right startups and how much scouting is needed?	3	Companies know and use only a few of the possible instruments for scouting startups	7	not supported	In average, six different scouting sources were used most companies were well informed about scouting sorces	105
Where do companies find the right startups and how much scouting is needed?	3	Companies only successfully implement solutions of a very small fraction of all the startups they analyze	8	supported	from all startups scouted on average, only 1,2% could successfully be implemented, 0,7% failed	106
Which methodologies and criteria are best suited to select startups?	4	Companies do not have a clar selection methodology	9	not supported	75% of all respondents claimed to have a clear selection methodology, whereas only 25% admit they do not.	107
Which methodologies and criteria are best suited to select startups?	4	Non-financial methods (i.e. scoring) play a more important role when it comes to startup selection than financial methods (i.e. NPV)	10	supported	the respondetns claiming to have a clar method never mentioned financial methods - a stage gate model was most often used (38%)	109
Which methodologies and criteria are best suited to select startups?	4	Some universally important startup selection criteria can be found	11	supported	Strategic fit and team/leadership were most often mentioned in open and closed questions	111
Who is and shall be involved in the selection process?	5	There are multiple departments involved in the selection of startups	12	supported	in average slightly more than seven departments are involved in the startup selection process.	111
Who is and shall be involved in the selection process?	5	There is a need for external help in the selection process.	13	supported	Two in three companies in the sample already include external experts in their startup selection almost all conceive to do so in the future Over 80% of the respondents would offer their service as a curator	115
What is the current and the desired tool support for the selection process?	6	There is a need for a platform which assists the open innovation and startup selection process	14	supported	75% of all companies in the sample already use specialized innovation managment tools a rich list of needed functionality was derived by this study	119

Chapter five of this master thesis will finally summarize the overall findings of the theoretical and the empirical part. It develops a practitioner's guide to startup selection, talks about the contribution of

this study to the main stakeholders and the ethical context. The main restrictions of the study are discussed and an outlook for future research is given.

5 CONCLUSION

To conclude this master thesis, the findings of the theoretical and the empirical part are summarized and distilled to develop a practitioner's guide to startup selection in Section 5.1.

The contribution to knowledge is described in Section 5.2, and the implications for the most important stakeholders as well as some ethical questions are discussed in Section 5.3.

Restrictions of this study are identified, and a brief outlook to future research is given in Section 5.4

5.1 Summary – Practitioner's Guide to Startup Selection

As an overall summary of the literature research and the empirical study, some guiding principles to help innovation managers in their startup selection projects are distilled. This fulfills the aim of the thesis described in Section 1.3.

This practitioners guide to startup selection is organized along the startup selection framework developed in Section 2.2.2 and summarizes the most critical findings answering the main research question and its six (sub-)research questions introduced in Section 1.3.

The author offers recommendations on how to best navigate through the process of the startup selection framework. Practitioners will find hints to avoid common pitfalls and best practices which surfaced in the explorative study.

The results and leanings of this study can be distilled to give innovation managers and practitioners the following recommendations.

Design innovation strategy to support open innovation and startup selection (RQ1)

Clearly define innovation and the business problem which shall be solved by the startup

As was shown in Section 4.2, innovation is often only vaguely defined and not differentiated from business as usual. For example, a mobile network provider shall not count the current implementation of its (innovative) 5G network as innovation but attribute it to the core business when it comes to budgeting or structural decisions.

Clearly defining the goal and the business challenge is vital before starting any startup scouting or selection project (see Section 2.2.2). To do that it is helpful to scout the trends influencing the industry and confront them with the strengths and weaknesses of the company. Useful checklists for drivers of innovation, which can be instrumental in defining the right goals and challenges are provided in the theoretical part of the study in Section 2.2.2. (Goffin & Mitchell, 2017, p. 49) and in the empirical part of this study (see Section 4.2)

Be aware of disruption and counter it appropriately

Adopt the current business model to the new market conditions and at the same time create a separate, disruptive business which can develop innovative solutions for future growth (Sood & Tellis, 2011). Primarily the later one can be supported by working with innovative startups.

Budget fast and ample to open- and transformative innovation

Be fast in budgeting decisions – long processes kill innovation and offend nimble startups.

Attribute at least one-third of the innovation budget for open innovation and startup selection. Spending 30% on open innovation surfaced as a benchmark in Section 4.3 (Figure 4.5) of this study.

Do not fall into the so-called incremental trap (Goffin & Mitchell, 2017, p. 211) only investing in less risky incremental innovation. This study's participants on average, invest 74% into incremental innovation (see Figure 4-7). Mind the golden ratio that 30% of the budget shall go to transformational or radical innovations – which likely create the most significant returns (Nagji & Tuff, 2012, p. 70). Most of these transformational ideas might come from the startup universe.

Define a transparent innovation process including startup selection processes (RQ2)

According to this study (see Section 4.4 Figure 4-8) innovation leaders already have a clear innovation process while the laggards still miss it. Do not fall behind – success in innovation and the startup selection projects depend on transparent processes.

Best practices, as discussed in more detail in Section 4.4, show that involving as many employees as possible into the process (via IT platforms) and making the process joyful helps.

The study showed (Section 4.4 Figure 4-12) that companies see implementation and getting the right people and culture as tough. Avoid silo thinking and turf wars and the not invented here syndrome as these are the prime inhibitors to successfully implement startup projects (Kirsner, 2018, p. 5). Foster an open innovation culture where startups feel embraced. Aligning expectations and respect for the cultural differences (as shown in Figure 4-15) are critical success factors.

Create a rich deal flow and use multiple scouting sources (RQ3)

This study showed in Section 4.6 (Figure 4-18) that only a tiny number (in this sample of 1,2%) of startup solutions, scouted can be successfully implemented. Therefore, an abundant deal flow of potential startup candidates is essential.

Using a greater number of scouting sources proved beneficial. The respondents of this study used an average of six sources (see Section 4.5).

Involve the rapidly growing and professionalizing players of the innovation ecosystem - as described in Section 2.3 - to help to build a great pipeline of startups.

Especially larger companies can substantially benefit from a motivated international workforce and by unsolicited startup applications (see Section 4.5 Figure 4-16). Both can be enabled by user-friendly software-applications, which make it easy to enter a startup application.

Universities and entrepreneurship events were used most often and rated as very effective (see Section 4.5 Figure 4-17) in scouting. Innovation labs, hackathons, accelerators, and incubators as well as management consultants can also be a great help.

It is recommended to take advantage of new crowdsourcing platforms (as introduced in Section 2.2.2 in Figure 2-2) and specialized innovation software tools (as analyzed in Section 2.5 in Table 2-7 but even more specifically in Table 2-8) to scout startups. Only a few companies in the sample of this study already started to tap into the vast source of up to hundreds of thousands of startups which can be made visible by these platforms.

Focus on non-financial selection methods and include external curators in the selection process (RQ4, RQ5)

Large companies often scout thousands of startups each year but implement only one or two hands full. As shown in Section 4.6, the sample in this study showed an average number of 759 startups scouted with only nine implemented. With large numbers of startups scouted the bottleneck in open innovation moved from scouting to the selection of startups.

Apply a clearly defined selection method – 25% of the respondents of this study have not done so yet, as described in Section 4.6 (Figure 4-18). Following precise methods and procedures might also help to mitigate the risk of behavioral decision biases or pure intuition as described in Section 2.4.1.

Stage-gate selection processes have shown to be the most common and useful selection method (see Figure 4-18). The author has developed a typical stage gate process for startup selection (see Figure 4-19), which can serve as a starting point for individual customizations. Allowing for an extended co-creation phase, which is used to evaluate the startup and methods using customer voting have also surfaced as exciting alternatives in the study.

Purely financial selection methods cannot be recommended as the primary method for startup selection because of a lack of reliable data, as discussed in detail in Section 2.4.3. Financial criteria can and shall, however, be included in scoring models as discussed in Section 2.4.4, especially when it comes to later stage startups or scaleups where the data quality is appropriate.

Choose selection criteria wisely. Strategic fit and team (leadership) seem to be universally relevant (Figure 4-20, Figure 4-21). Other often used criteria are vision, technical and commercialization capability, maturity stage, and the product idea.

Select the departments involved in startup selection carefully and involve people at high hierarchy levels. In this study, it showed that on average seven departments were involved which goes along with other studies which found up to 10 departments taking part in the startup selection (YOUNIS et al., 2017, p. 6). Involving many departments is critical as too many people involved might slow down the process.

Include external experts into the startup selection as two-thirds of the companies in the sample of this study already do (see Figure 4-24). According to the results, especially managers coming from the same industry, industry experts, customers, founders/entrepreneurs in the same industry or tech experts were rated in to be helpful (see Figure 4-25). Finding external curators might be easier than expected as top managers are often willing to serve as external curators. Over 80% of all participants of these study agreed to do so (see Figure 4-26).

Use unified innovation management platforms for scouting and selecting startups (RQ6)

Innovation management but also open innovation and startup selection have a huge potential to get digitalized and automated. The study showed that 75% of the sample already use on average more than two (specialized) tools to support innovation management (see Section 4.7).

However, most of the tools focused on closed innovation and internal ideation and were homegrown software islands (see Table 4-7). Companies still have a vast potential to take advantage of newly emerging unified software solutions (as described in Section 2.5) which embrace closed-and open-innovation. The latest tools do not only help in scouting and enable to participate in substantial network effects linking up to hundreds of thousands of startups and many thousand experts but also enhance their matchmaking and selection capabilities. The author recommends taking advantage of these emerging packaged software solutions.

Based on the user feedback in this study, the author also developed a model for an ideal future innovation management platform, as described in Section 4.7 and depicted in Figure 4-27. The main building blocks of such a future platform would be an attractive UX, collaboration-, portfolio-, startup relationship- and knowledge-management functionalities paired with AI for matchmaking. This model might serve as an inspiration for all corporates that want to enhance their proprietary solutions or for software vendors who want to improve their offering further.

5.2 Contribution to knowledge

Companies see innovation as high and rising in importance and increasingly look for outside innovation. However, their ability to professionally manage the search, selection, and integration of outside innovation is limited. With ever larger numbers of startups getting scouted the main bottleneck for the success in open innovation moved from scouting to the selection of startups (see

Section 4.6). Despite the rising relevance of startup selection, there is a painful gap in the literature and a lack of studies and theory, which is widely acknowledged and bemoaned by scientists and practitioners (see Section 1.2.5).

The main contribution of this study is to address this gap and provide answers to the main scientific question of how the startup selection problem can be solved more effectively and efficiently.

This is achieved by applying the open innovation framework (Chesbrough, 2006) and the "*Innovation Pentathlon Framework*" (Goffin & Mitchell, 2017) to the startup selection problem thus **creating a startup selection framework** (see Section 2.2.2). This startups selection framework can help practitioners as a guide and structure to work through their startup selection problem.

A **critical discussion of portfolio theory and financial and non-financial selection methods** helps to understand the utility of these methods for the specific problem of startup selection (see Section 2.4). It allows practitioners to choose the right method in the right situation and to reflect on the up- and downsides of their application. The **identification of possible behavioral biases** contributes to understand the psychological side of the startup selection processes better and to mitigate these risks by implementing and applying appropriate processes and methods. An **analysis of the players in the innovation ecosystem** and their current development helps to understand their role and contribution in selecting startups (see Section 2.3).

As a synthesis of the theoretical and empirical findings of this study, the **author developed a practitioner's guide to startup selection** (see Section 5.1). This guide helps innovation managers and other innovation practitioners to

- refining their innovation strategy
- creating a rich deal flow by using appropriate sources to scout and find startups
- choosing the appropriate startup selection methodology and criteria
- appointing the best-suited selection teams
- getting improved IT support

A **typical stage gate process was developed** (see Figure 4-19), which can serve as a model to customize processes for the individual selection project.

One main contribution of this study is not only to **investigate and classify the available software solutions and platforms for innovation management and to analyze their utility for startups selection** (see Section 2.5) but to **create a model for an innovation management platform** of the future (see Section 4.7 Figure 4-27).

5.3 Implications for relevant stakeholders and ethical considerations

Most of this thesis was written with **the innovation manager of a large corporate** in mind. Innovation managers can benefit from this study in multiple ways. They can structure their startup selection program taking advantage of the startup selection framework proposed in Section 2.2.2 evaluate and find the right selection methods as discussed in Section 2.4 or get stimulated by the suggestions and benchmarks given in the practitioner's guide to startup selection described in Section 5.1.

Of course, CEOs and other managers or experts contributing to a startup selection project in the corporate world would equally benefit. Most of the findings not only apply to any one particular industry but would apply with little customization for multiple industries, for the non-profit, public sector, or smaller organizations. However, more research will be needed to undermine his assumption (see Section 5.4).

Additional target groups benefitting from this study are the **players in the innovation ecosystem**. As discussed in Section 2.3, especially **accelerators, incubators, and financing entities like VCs, CVCs, and angel investors** face severe startup selection challenges. These mostly smaller organizations frequently must select thousands of startup applications with a tiny selection team. In-depth studies investigating their unique needs and criteria might be worth undertaking (See section 5.4).

External **selection experts, professional curators, and academics** might also be interested and benefit from the findings of this study.

Essential target groups are the **entrepreneurs and startups**. Although the study is mainly written from the perspective of larger enterprises, startups will benefit from understanding the other side. Startups will find some suggestions on which software platforms to use to get more visibility to corporates and investors. They can morph their applications to the criteria and methods suggested in this thesis to corporates and financing entities.

Finally, **every company developing an innovation management tool or platform** can benefit from this thesis. This applies to in-house developers and vendors of packed innovation software tools or the creators of other innovation platforms. They will not only get an up to date snapshot of the tools in the market and their functionality regarding startups selection, but can get inspiration by reflecting the model for an innovation management platform of the future which was crafted structuring the inputs of the experts and practitioners contributing to this study (see Section 4.7).

As discussed in Section 1.2.1, innovation has not only a **micro-economic but also a macro-economic implication**. The mechanism of creative destruction may cause wealth and employment in new industries but unemployment and destruction in incumbent ones. This thesis might contribute to more transparency and efficiency in the innovation mechanisms of the payers in the innovation ecosystem mentioned above, thus enhancing and speeding up the double-edged mechanisms of creative destruction. The author is convinced that the immense challenges of our time – be it the burning

environmental or social issues – can only be successfully mastered with creativity and innovation. Some very optimistic authors describe this development having the potential to make most of the world's scarce resources abundant in the future (Diamandis & Kotler, 2012)(Ismail et al., 2014, p. 299). The individual solutions promoted through a more effective startup selection, of course, must undergo a thorough technology assessment.

5.4 Restrictions and Future Work

This study is mainly based on literature research and qualitative expert interviews and therefore suffers from the usual **restrictions of qualitative research**. The main restriction is the **limited ability to generalize the results**. The author recommends follow up studies using larger representative samples and quantitative evaluation methods to harden the results.

Not only the size but also the **composition of the sample** set limits and constraints to generalize the results. Not all industries, stakeholders, or company sizes or regions were represented in the sample. Follow up studies could shed light into the question if the (hypo-)thesis and conclusions found in this study would equally apply for different industries, different sectors (profit, non-profit, private, public), different payers in the innovation ecosystem (accelerators, incubators, VCs, …) or regions (US, Asia, …).

As the subject of innovation management and startup selection is developing very dynamically, **longitudinal studies** would be of interest to learn about the nature of these developments and trends. Such longitudinal studies could potentially explain the observed professionalization which the root cause might be why of three of the (hypo-)thesis derived from the literature had to be rejected (see Section 4.8)

As described in Section 3.11, coding was documented and often done twice to ensure intra-coder reliability. One **restriction** is that no second researcher checked the analyses and the coding of the transcripts. **Intercoder reliability**, as suggested by some authors (Bernard, 2013, p. 542) (Philipp Mayring, 2015a, p. 53), **was not undertaken** mainly because of resources restrictions.

An exciting question for future research will be how accurately the different selection criteria predict the actual success of the startup projects and if companies using specific methods and criteria are performing (financially) better.

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7 APPENDICES

Appendix 1: Information sheet

How to systemically select the right Startups?

Based on the Master Thesis – by Mag. Martin Hammerschmid

As an entrepreneur and executive working constantly in the field of Open Innovation I am working on my master's thesis on improving how we systematically select high potential startups globally. As part of this research, I am interviewing leading practitioners in Innovation, including Accelerators, Investors and Corporate internal VCs (CVC).^snypi

You will receive the results of this learning about best practices on how to find, select and implement innovative startups to support your strategic innovation goals, including:

- The latest theories and findings in Innovation Management
- Outline which are the global best practices in open innovation
- Help you scout and select successful startups, using the best tools and methods

The personal or Skype/phone interview will take about 30 minutes will cover the following key topics:

- Importance of innovation
- Investments in internal innovation (R&D) vs. open innovation (startups)
- Risks of being disrupted and how much is invested in incremental vs. disruptive innovation
- Difficulties in the innovation process
- Sources to find (scout) the right startups
- Number of startups evaluated, and successful projects implemented
- Methods and criteria used in the selection process
- Persons involved in the innovation/selection process
- Current and desired tool support

Your answers will be treated anonymous.

Appendix 2: Interview Guideline

Shopping 4 for Innovation

How to Select the Right Startups

Master Thesis Project – Mag. Martin Hammerschmid

Interview Guide - semi structured interview

After many years in leading management positions I became a passionate entrepreneur and consultant in the field of open innovation. Currently I am working on a scientific thesis at MODUL University focused on the startup selection problem. Part of this study are brief semi structured interviews with global innovation leaders, accelerators and CVCs.

Please support me with approx. 30min of your time for such an interview.

You will benefit by receiving the results such learning about best practices on how to find, select and implement innovative startups to support your strategic innovation goals.

The thesis shall

- Get you informed about the latest theories and findings in innovation management
- Give you global best practices in open innovation
- Help you understand and pick the right methodologies, tools and criteria for scouting and selecting startups to reach your innovation goals

All answers are evaluated in an anonymous way.

Please share your experience in answering the following questions.

1. What is innovation for you? (open question)

2. How important is innovation for your company? (rating scale 1-5)

Very Important	Important	Moderately Important	Slightly Important	Not Important

   a. How will the importance of innovation develop in the next 3 years (no middle value!)?

strongly fall	fall	rise	strongly rise

3. How much of your revenues is invested into innovation? (rating scale with percentages)

under 5%	5%-10%	10%-15%	15%-20%	over 20%

4. How much do you invest in internal innovation (R&D) and how much in open innovation (innovation from outside into your companies i.e. startups)? (percentage 0% till 100%)

1%-100%

5. How big do you see the risk of being disrupted (Likert scale 1-6 likelihood no middle value!)

Definitely	Very Probably	Probably	Possibly	Probably Not	Definitely Not

6. How much of your innovation budget do you invest in incremental innovation (improving processes and current products) and how much in disruptive innovation (new business models, new products for new markets)?

% of invest in incremental innovation	% of invest in radical innovation

7. Do you follow a clear innovation process? (Y/N)

Yes	No

a. If yes, please describe it (**open** question)

9. How important are the following phases of the innovation process? (Explain the phases if needed)

a. Innovation Strategy (very important to unimportant)

Very Important	Important	Moderately Important	Slightly Important	Not Important

b. Scouting of startups (very important to unimportant)

Very Important	Important	Moderately Important	Slightly Important	Not Important

c. Selecting startups (very important to unimportant)

Very Important	Important	Moderately Important	Slightly Important	Not Important

d. Implementing of startups (very important to unimportant)

Very Important	Important	Moderately Important	Slightly Important	Not Important

e. Installing the right people, culture and organization supporting open innovation (very important to unimportant)

Very Important	Important	Moderately Important	Slightly Important	Not Important

10. How would you rate the difficulty level for your company to perform well in the following phases of the innovation process?

    a. Innovation Strategy (very easy to very difficult)

Very Easy	Easy	Average	Difficult	Very Difficult

    b. Scouting of startups (very easy to very difficult)

Very Easy	Easy	Average	Difficult	Very Difficult

    c. Selecting startups (very easy to very difficult)

Very Easy	Easy	Average	Difficult	Very Difficult

    d. Implementing of startups (very easy to very difficult)

Very Easy	Easy	Average	Difficult	Very Difficult

    e. Installing the right People, culture and organization to support open innovation (very easy to very difficult)

Very Easy	Easy	Average	Difficult	Very Difficult

11. Which Instruments for finding startups do you use? (open question)

12. Which of the following methods/instruments to find startups do you a) use? b) please rank them according to their effectiveness (1 is most effective to X is least effective)

Nr		Used make a X	Rank 1-X
1	Hackathons		
2	Marketplaces		
3	Accelerator (Inhouse)		
4	Accelerator (External)		
5	Incubator (Inhouse)		
6	Incubator (External)		
7	Corporate Venture Capital		
8	Innovation Labs		
9	Management Consutants		
10	Enterpreneurship Events (Hosted)		
11	Enterpreneurship Events (Attended)		
12	Silicon Valey offices, outposts or regular tours		
13	Unversities		
14	others		

13. How many startups do you a) scout b) evaluate each year?
    a. Nr
    b. Nr

14. How many successful / unsuccessful implementations of startup solutions did you have last year? ("Success" might either be a commercial pilot an integration an investment or a M&A)

Number of Successful Implementations	Number of Unsuccessful implementations

15. Selection Method

a. Do you have a clear selecting methodology? J/N
b. What is your methodology to select startups? (open question)

16. Which are your most important criteria selecting startups?

a. Open

b. Closed (give a list which the interviewee shall rank)

Nr.	Criteria	Rank
1	Strategic Fit	
2	Financial Reward (Cost)	
3	Risk & Probabliliy to success	
4	Timing	
5	Technical capablility	
6	Commercializaiton capability	
7	Protectablility	
8	Trust	
9	Synergy between Projects	
10	Vision	
11	Team leadership	
12	References, Clients of the startup, Awards	
13	other	

17. Who is involved in the selection process?

a. Open

b. Closed (list) and on which hierarchy level?

		on which hierachy level			
	Involved - X	C-level	SVP/VP	Director/Manager	Associate
Corpoarate Innovation					
Business Development					
Legal					
Corpoarate Development					
Investments					
Procurement					
R&D					
IT					
Product Managment					
Marketing					
Finance					
Sales					
other 1					
other 2					

18. Do you include external experts in the selection of startups? (Y/N)

Yes	No

18. a) If yes - whom? Please specify the kind of organization and expertise i.e. University Prof., management consulting, …

19. If No - Would you appreciate including external experts in the selection process?

Yes	No

19. a) If yes - whom? (please indicate which organization or expertise level)

20) How helpful would you rate the following external expert categories for your startup selection process?

		helpfulness				
Nr	Kind of Expert:	not helpful	slightly helpful	moderately helpful	helpful	very helpful
	academic					
	industry expert (external curator)					
	manager of a companiy in your industry					
	manager of an other industry					
	investors					
	bankers					
	managment consultant					
	other					

21) Would you offer to be curator (selection expert) for other companies (in/outside your industry)?

Yes	No

22) Which SW tools do you use to support your Innovation process? (open)

23) What would it be your ideal innovation tool? What features / functionalities/ capabilities it can potentially add? (open)

Additional statistical questions for the statistics of the questionnaire:

Size of your organization

Nr of employees	
under 500	
500-1000	
100-5000	
5000-10.0000	
10.000-20.000	
20.000-50.000	
50.000-100.000	
100.000-200.000	
above 200.000	

Location of your Organization (Country of HQ)

Your job titles

Reporting line to which role

C-level	SVP/VP	Director/Mar	Associate

Industry

Appendix 3: Example Coding for Question 1 “What is innovation for you”

Interview Nr	Page	Line Number	Parapharse	Gernaralization	Reduction	frequency
I1	1	14-15	anyting that can create value to the bank	crates value to the company	crates value to the company	7
I1	1	24	process impovement	process innovation	process innovation	4
I1	1	25	new technology, phyical device	product innovation	product innovation	4
I1	1	22	create a startup and develop it to a large corporate	disruptive innovation	disruptive innovation	2
I1	1	20	incremental developments	incremental innovation	incremental innovation	1
I1	1	26	change in business model	business model innovation	business model innovation	1
I1	1	13-14	it is a simple yet very complex qestion	easy but complex to answer		
I1	1	27	delivers value to the company	~~crates value to the company~~		
I1	1	27-28	value can be revenue, profit, cost decrease or user experience	~~crates value to the company~~		
I2	1	39	share ideas in the network	open innovation	open innovation	3
I2	1	36	belive that innovation is a culture	innovation culture	innovation culture	2
I2	1	37-38	discover and accept something new every day	something new	something new	2
I3	1	14	serve customer need	creates value to the customer	creates value to the customer and fulfills customer needs	8
I3	1	14	superior technology	~~product innovation~~		
I3	1	17	white spot in our portfolio	~~creates value to the company~~		
I3	1	18	improve customer experience	~~creates value to the customer~~		
I3	1	21-22	togehter with our partners …open innovation	~~open innovation~~		
I4	notes	1	digital transformation	~~disruptive innovation~~		
I5	1	5-6	new solutions for the customer	~~creates value to the customer~~		
I5	1	6	new processes	~~process innovation~~		
I5	1	8	added value for the customers	~~creates value to the customer~~		
I5	1	12	custome prepared to pay for it	~~crates value to the company~~		
I5	1	13	can we save costs	~~crates value to the company~~		
I6	1	11	changing our business model	~~business model innovation~~		
I6	1	12-13	improving internal processes	~~processes innovation~~		
I6	1	13	collaboration	~~open innovation~~		
I6	1	17	products we provide to the market	~~product innovation~~		
I6	1	16	impact on business	~~crates value to the company~~		
I6	1	16	impact on customers	~~creates value to the customer~~		
I7	1	51	products have to be successful on the market	market success, implementation	market success, implementation	2
I7	1	8-9	huge difference between innovation and research, development and real new stuff	is not R&D	is not R&D	
I7	1	50	build new products	~~product innovation~~		
I8	1	39-41	step-up on technology and delivering products and services for the new customer behavior	~~respond to new customer needs~~		
I8	1	49	capability to create something new what customers need	~~something new~~		
I8	2	74-76	inovation as the discipline to moove as fast as the needs of customers change	~~respond to new customer needs~~		
I10	1	12	step into a new direction based on what had been developed in the past	new direction base on past developments	new direction base on past developments	
I11	1	13-15	new means to solve an existing problem or finding a new space, market or problem to solve with existing means.	probem solving	probem solving	
I12	1	9-10	has to be new and useful	new and useful implemented		
I12	1	12	has to bring value	crates a value	crates a value	
I12	1	13	makes money	~~market success, implementation~~		
I13	1	9	driver for competitiveness	driver for competitiveness	driver for competitiveness	
I13	1	14-15	innovation as culture	~~innovation as culture~~		
I14	1	59	confimation for the customer	~~customer confrimation~~		
I14	2	69	innovation needs new thinking patterns	new thinking patterns	new thinking patterns	
I14	2	72-74	process innovation to always improve each step with the technology which is available	~~process innovation~~		
I15	1	88	do different thing and do them in a different way	~~product and process innovation~~		

Appendix 4: Example Coding for Question 7a "Do you follow a clear innovation process? a) If yes, please describe it."

Variable	Value	Definition	Anchor samples	Encoding rules	markes in text	found in which interview and where	frequency
professionalism of innovation process	Highly professional innovation proces	discribes clear steps in the process and/or roles involved and/or methods/tools applied	You say „scout"/"scouting", always, like I told you internal and external. „Check" means we organize everything, we do a lot of prototyping, so we build the things. [...] And then the third part is „Make it happen" [...] we collect the ideas [...] in a big pool. And then we do relevance checks, [...] we organize a kind of innovative brainstorming, we call it „Jam sessions" [...] out of this jam session then we go into a process of testing, adjusting [...] like a scrum process [...] after the prototypes when we did prove a concept in the daily business and we see the value then we immediately invite the business units [...] they organize the budgets [...]to produce a market-ready product	an innovation process only counts as highly professional when at least two of the three definition criteria can be found	if two definition criteria were found in the text they were marked in green	I1 124f, I2 395ff, I7 318ff I10 117ff I14 186ff	5
professionalism of innovation process	Medium professional innovation process	discribes either clear steps in the process or roles involved or methods/tools applied	We created a structured and transparent framework for innovation. we also have an innovation branch which is a physical laboratory [...] We also provide with a IT tool such as an idea platform	an innovation process counts as medium professional only when at only one of the three definition criteria can be found	if one definition criteria were found in the text they were marked in red	I5 74ff, I6 100ff I8 258ff	3
professionalism of innovation process	Poorly professionalized innovation process	does not discribe either clear steps in the process or roles involved or methods/tools applied	This is a project we are working on. How could we design the innovation process? How could we establish processes? This is the main task of this group working on that. But what we have now is more or less innovation either very close to the business coming from incremental technological processes and steps forwards, but not systematically. It´s more by chance.	an innovation process only counts as poorly professional when at non of the three definition criteria can be found	if non of the definition criteria is found ther is no mark or yellow marks for other important information	I4 61ff I16 268ff	2
do not follow a clear innovation porcess	do not have a clar innovation process					I3 111f, I11 137, I12 131f I13 151f I15 (notes)	5
exact level could not be evaluated because no full recording was available	not applicable					I9 (notes)	1