CHALMERS

..

Front-End Idea Screening of Potential Radical Innovation in Large Firms

A holistic framework for the Volvo Group

Master of Science Thesis
in the Management and Economics of Innovation Programme

ALEXANDRA HULTGREN
ASMA TANTAWI

Department of Technology Management and Economics
Division of Innovation Engineering and Management
CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden, 2014
Report No. E 2014:054

MASTER'S THESIS E 2014:054

FRONT-END IDEA SCREENING FOR POTENTIAL RADICAL INNOVATION IN LARGE FIRMS

A holistic framework for the Volvo Group

ALEXANDRA HULTGREN
ASMA TANTAWI

Tutor, Chalmers: Sofia Börjesson and Anne Elerud-Tryde
Tutor, company: Thomas Hordern

Department of Technology Management and Economics
Division of Innovation Engineering and Management
CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden 2014

Front-End Idea Screening for Potential Radical Innovation in Large Firms

Alexandra Hultgren and Asma Tantawi

Master's Thesis E 2014: 054

Department of Technology Management and Economics
Division of Innovation Engineering and Management
Chalmers University of Technology
SE-412 96 Göteborg, Sweden
Telephone: + 46 (0)31-772 1000

Chalmers Reproservice
Göteborg, Sweden 2014

Abstract

Radical innovation is of great importance to firms' long-term economic growth and competitive advantage. Simultaneously, the very earliest activities of an innovation process have high importance for firms' radical innovation success. Ideas for potential radical innovations are very early solutions to problems, of which not all can be realised or expensively evaluated. Therefore, it is necessary to have procedures for evaluating and developing ideas in the early phases, known as idea screening. Successful idea screening of potential radical innovation ideas gives generated ideas strategic, technological and business meaning, provides the front-end of innovation with competitive and business potential, and mitigates that money is spent on wrong ideas. However, a holistic representation of what large firms needs to consider when organising their screening process for potential radical ideas was missing in literature. Therefore, the purpose of this research is to understand how a large company, such as Volvo, should organise their screening process for potential radical innovation.

The research followed an explorative inductive approach, with a qualitative research strategy, as the research aimed to investigate the phenomena of potential radical innovation screening, and generate new knowledge and insights. It combined findings from three sources of data to reach its purpose. Literature regarding the evaluation process for potential radical ideas in the early phases was complemented with literature from entrepreneurship and venture capitalism. Experts within the fields were interviewed to complement, contrast and update the knowledge present in literature. Additionally, a multiple case study was conducted to understand today's best practice in large firms.

The research provided several findings. A framework representing areas to consider when organising the screening process for potential radical ideas in large firms was presented. This showed that the process' structure, methods to use, criteria for evaluation, and stakeholders affected and affecting the process should be considered. Further, the findings related all these areas to each other. The research proposes a three-phase structure of an explorative and iterative nature, with checkpoints along the way. The screening process is a learning activity, where ideas are changed and pivoted based on new information. It is to be a culling activity, where methods and criteria become harsher as the evaluation and development progresses. The process ends with a specified business case. The methods presented have different aims, and can be viewed as modules making the process flexible. At the first evaluation – checkpoint 1 – criteria should be formulated as showstoppers within the areas desirability, strategic fit, viability and feasibility, and map stakeholders. At checkpoint 2, more detailed criteria within additional areas can be used. Evaluators should include business units, consider including the idea generator initially or through events such as Dragon's Dens, be able to bear with uncertainty, have experience, and represent cross-functional knowledge. Management needs to show support and motivation, and provide resources needed to take the ideas forward in the firm.

Keywords: Radical Innovation, Front-End of Innovation, Idea Screening, Large Firms, Framework, Process, Entrepreneurship.

Acknowledgements

With this thesis, we now finalise the five years that we have spent at Chalmers University of Technology. We would like to start by saying that it has been a fun, exciting and tough journey. Even though we have come out of it a little bit older, we have also grown to become a lot smarter. We are grateful for all the things we have learned throughout these years, as well as throughout the process of this research.

Special thanks are given to Anne Elerud-Tryde at Chalmers University of Technology for supervising, guiding and encouraging us throughout this journey. Moreover, we would like to give a special thanks to Thomas Hordern from the Volvo Group, for trusting us with the assignment, and similarly to Anne, supported and encouraged us from the outset and throughout. We also want to thank all the interviewees; within the Volvo Group, the companies included in the case studies, and the experts. All of you have made this research possible, providing us with many useful insights, which made this an exciting and interesting field of study.

Gothenburg, June 2014

Alexandra Hultgren and Asma Tantawi

Table of contents

Table of figures

Table of tables

1 Introduction

1.1 Theoretical context and problem definition

"Without some way of managing this selection process, firms are merely gambling – which carries a high risk of failure in firms" (Bessant *et al.,* 2010: 346).

Academic literature widely recognises the great importance of innovation to firms' economic growth and competitive advantage (*exempli gratia* Nelson and Winter, 2002), where radical innovations provide the foundation for long-term growth (Leifer *et al.,* 2001). These innovations are however related to high technical, market, organisational, and resource uncertainties (Leifer *et al.,* 2001). The front-end of innovation, hereafter referred to as the FEI, is the phases prior to when a new product, process, or services project is given a go/no-go decision, and has high importance to radical innovation success (Bessant *et al.,* 2010). These activities determine the firms' innovation direction, have highest influence over time and cost savings for projects, lead to competitive advantage (Reid and de Brentani, 2004), and provide capacity to learn and adapt (Martinsou and Poskela, 2009; 2011). Hence, the FEI is of great importance as today's businesses are faced with shorter product and technical life cycles, and rapidly changing market environments (Langerak *et al.,* 2004).

A successful screening method in the FEI is of vast importance for firms. For incremental innovations, the screening process of gathering information and building a business case is rather straightforward, as it lies within the comfort zone of the firm. The pressing issue lies, rather, where companies need to choose innovative ideas that lie outside of their prior experiences, or outside their current strategic efforts (Bessant *et al.*, 2010). Opportunities and ideas are the origin of all innovations, and contribute greatly to the potential of firm success. Ideas for radical innovations are however also very early, only fuzzy, solutions to problems, of which not all can be realised or expensively evaluated. Hence, it is necessary to have procedures for evaluating and developing ideas (Boeddrich, 2004). Successful idea screening of ideas for radical innovations helps in providing generated ideas strategic, technological and business meaning (Zarah, 2008), the FEI competitive and business potential, and mitigates that money is spent on wrong ideas (Martinsou and Poskela, 2011). This is important, as it is much cheaper to change a concept early than later on in a development process (Reid and de Brentani, 2004). However, as noted by Elerud-Tryde and Soonvald (2011), much literature instead concerns idea generation: few articles devote full attention to the process of screening radical ideas, and areas of consideration related to it, in the FEI. Literature states that idea selection and iterative development (Koen *et al.* 2001), strategic fit (Martinsou and Poskela, 2009), individuals' characteristics (Stevend and Burley, 2003) and management support (Bessant *et al.,* 2010) are important for succeeding in uncertain innovation efforts. However, there is a gap in the literature, where there is a need for presenting a holistic approach for how large firms should set up their idea screening for radical innovations, with areas to consider and how these affect each other. This then needs to include adequately the areas of the

firm's strategic choices, stakeholder management, and the tacit factors greatly influencing the process, rather than merely specific gates and criteria.

1.2 Empirical context and problem definition

Volvo Group, hereinafter referred to as Volvo, is a publicly held firm, and one of the world's leading manufacturers of buses, trucks, construction equipment, and marine and industrial engines. Volvo has its head quarter in Gothenburg, Sweden, employs approximately 110 000 people, and attends to 190 markets (Volvo Group, 2014). It has also recognised the need for improved innovation work.

Olof Persson was in 2011 named Volvo's new CEO, and initiated a major restructuring programme (European CEO, 2014). Hence, 2012 was characterised by formulation and implementation of a new vision, strategic objectives, a 2020 vision, new financial targets with an increased focus on cost reductions, a new organisational structure and management teams, and a stronger focus on a process-oriented workflow throughout the group activities. Persson incorporated an increased focus on Volvo's core business, including several acquisitions, measurements for the group 2013-2015 strategy, and a group-wide efficiency programme. According to the group's 2013 annual report, they also want a dedicated product and processes innovation work (Volvo Group, 2013).

The firm's new vision is to be the world leader in sustainable transport solutions. Volvo has also recognised the importance of being able to act on changes in the business environments and customer needs (Volvo Group, 2012: 2013). It aims to create value for customers, pioneer products and services for the transport and infrastructure industries, and drive quality, safety and environmental care (Volvo Group, 2013). This implies a need for innovation with a certain newness level. The firm does however not have set processes for radical idea screening.

In November 2013, Volvo expressed an interest in understanding how the screening and development of radical ideas can be organised and influenced by *exempli gratia* their vision, strategy and brand. It also aimed to learn from a combination of literature and best practises (Volvo Group Sverige, 2013), which is in line with this report's author's focus on the identified literature gap presented above. Hence, the case of Volvo is interesting to study. Further, interviews show that several other companies are interested in learning more about the screening process and related areas for potential radical innovations as well, and are uncertain of their current practises' success level.

1.3 Purpose and research questions

Radical innovation is important for firm growth and competitive advantage, where the FEI is of great importance for project success. However, an academic gap has been identified, as there needs to be a representation of how the screening process should be organised for large firms on a holistic, managerial level. This needs to further combine knowledge within the FEI field, and incorporate areas such as stakeholder management and business strategy. This understanding is also something Volvo is aiming to reach.

Hence, the purpose of this study is to understand how a large company, such as Volvo, should organise their screening process for potential radical innovation.

Radical innovation here refers to innovations that are new to the firm. In order to answer the research's purpose, one research question has been formulated, further divided into two sub-research questions.

RQ) When critically comparing and combining findings from SRQ1 and SRQ2 with reviewed literature, how can the process for idea screening of potential radical innovation in the FEI be organised for the Volvo Group?

> **SRQ1)** What complementary knowledge can be gained from experts within the fields of Venture Capital, Entrepreneurship, and FEI regarding idea screening for potential radical innovations?
>
> **SRQ2)** What does best practise look like today in large firms regarding idea screening for potential radical innovation in the FEI?

1.4 Delimitations

This research only regards radical innovations, defined as an innovation that is new to the firm. It does not include incremental innovations, as literature states that idea screening for incremental innovation is much more well understood in literature in firms, that it is an easier process for companies to master (Bessant *et al.*, 2010) and as a choice had to be made due to time constraints. The specific definition is chosen as previous research showed that ideas for potential disruptive innovations should have a different, even less formalised, set-up than ideas for new-to-the-firm innovations. Hence, it would not be possible to present a framework suitable for potential radical innovation ideas spanning the newness levels new-to-the-firm to disruptive. Many definitions can be found of what radical innovation means, whereby the research also becomes more targeted and focused by using one specific definition.

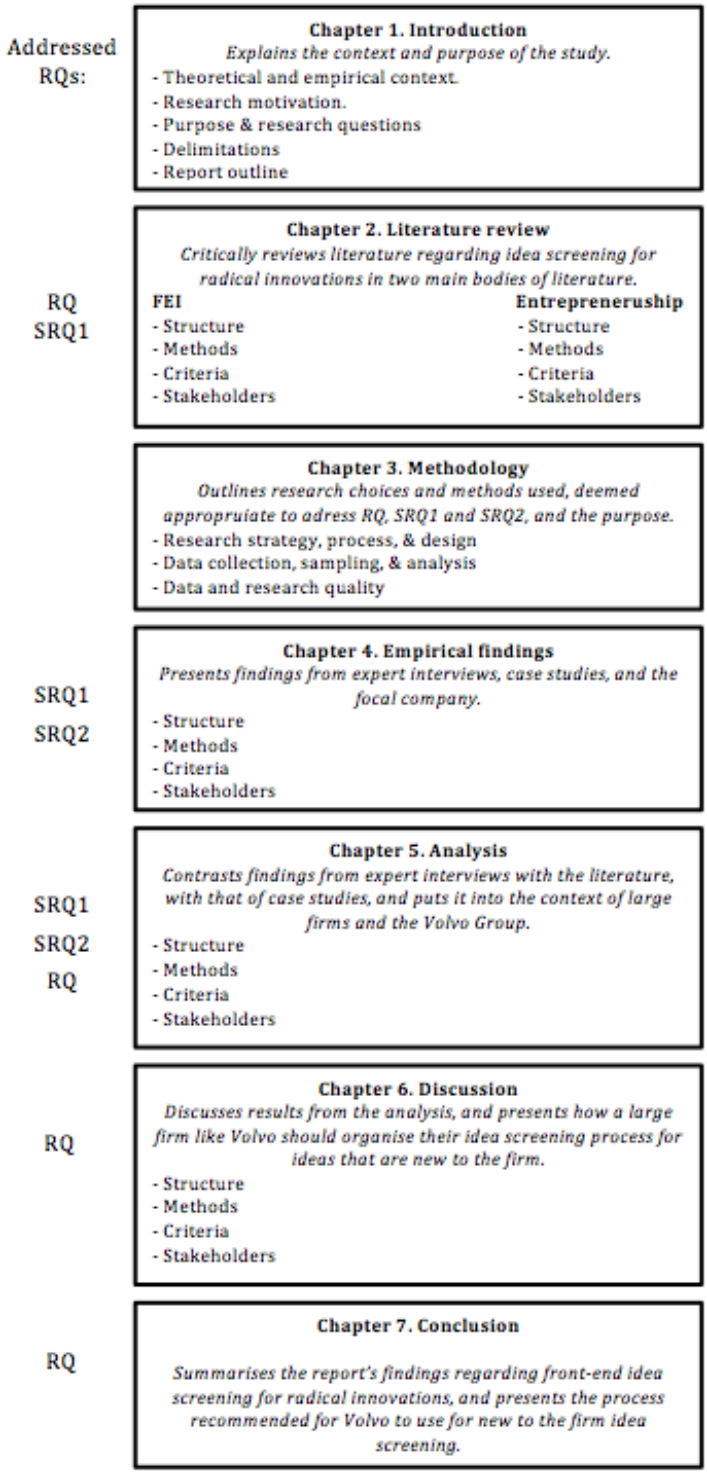
The research excludes studies and recommendations for small and medium sized firms. Small and medium sized firms do not have the same practical context as large firms, whereby a framework would not be suitable to represent all sizes. Additionally, several large firms were identified to be interested in the results through interviews, which highlighted a need for the research to provide the focus on large firms. The absence of a holistic representation of the screening process in large firms was also identified as a gap in the literature by the authors of this report. Further, only focusing on large firms made the findings comparable. The case studies have only included firms with over 2000 employees.

It should also be noted that the success of the presented recommendations cannot be evaluated until the ideas have been chosen, developed and implemented. As the research focuses on radical innovations, this lies far outside this research's time frame.

1.5 Report outline

The report outline is presented in figure 1-1 below, which presents each chapter, its purpose, what research question(s) it will address, and its structure. To create a consistency throughout the report in answering the research's purpose, chapter 2, 4, 5, and 6 follow the same structure. They discuss four areas identified by the authors of this report to be most important to regard when organising the FEI idea screening for potential radical innovations that are new to a large firm. The areas are *Structure* – how the screening structure for potential radical innovation screening should be set up, *Methods* – methods to be used by the large firm throughout the process to achieve various goals, *Criteria* – what areas of criteria large firms can use in the screening process for ideas regarding innovations that are new to the firm, and *Stakeholders* – stakeholders that influences the process, as well as stakeholder management.

Figure 1-1. Report Outline



2 Literature Review

This literature review aims to critically present the existing literature regarding the organisation, management and practises of idea screening. It will provide knowledge needed of what is known about ide screening for potential radical innovations within FEI literature today. The review will further complement FEI literature through presenting literature relating to idea screening for potential radical innovation from the field of entrepreneurship, as it has been identified to discuss idea screening of innovations to a great extent. Hence, it can provide additional perspectives and knowledge of idea screening for potential radical innovation, and is chosen to be included to broaden the knowledge currently present in FEI literature. The literature review also aims to highlight gaps, guide data collection and analysis, to be a basis for analysis of empirical findings, and to partly address SRQ1 The chapter is structured around four overarching areas. The authors of this report have identified them to be the ones that both FEI and entrepreneurship literature regarding idea screening for potential radical innovation can be categorised into. An overall conclusion based on the two areas will conclude the chapter. See figure 2-1.

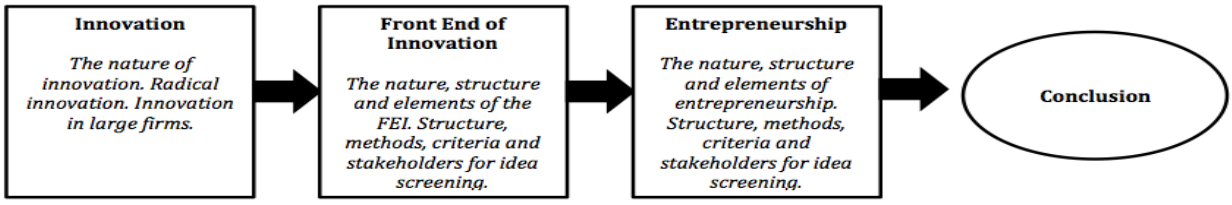


Figure 2-1. Chapter 2 Outline

2.1 Innovation

The purpose of this section is to provide an introduction to innovation and the different types of innovation that are discussed in existing literature. The intention is to give an understanding of innovation from the outset, to ease the comprehension of the literature to come.

Innovation and technological changes are the source of a firm's competitive advantage and therefore also the drive for economic progress (Nelson and Winter, 2002). Leifer *et al.*, (2001) highlight the importance of radical innovations and how they provide the engine for long-term growth (Leifer *et al.*, 2001). This clearly implies the importance for firms to be innovative, but also underpins the importance of defining the involved terms, since there is clearly a disparity in the literature regarding the different definitions.

Innovation is one of those definitions where different authors and different institutions have dissimilar views of the term. Some define innovation as an iterative process where an invention is commercialized through development, production and marketing tasks (Garcia and Calantone, 2001). Van de Ven (1986) define innovation as an idea, which might be a recombination on old ideas or unique approaches to something, which is perceived as new to the individuals involved. Hence, an innovation might be regarded as an imitation to some, but new to others, and will thereby still be regarded as an innovation to those involved. Similarly, Rogers (2003) defines innovation as an idea, which the adoption unit perceives as new. Therefore, innovation is in this

literature review regarded to be a commercialised idea, process or practise that the adoption unit(s) perceives as new.

Literature further differentiates innovation in the sense of what type of innovation it is, i.e. product, process, position or paradigm innovation (Bessant and Tidd, 2013). Product innovation refers to changes in products or services that an organisation offers, whilst process innovation refers to changes in the way that products or services are either created or delivered. Furthermore, position innovation is explained as changes in the context in which the products or services are framed and communicated, whilst paradigm innovation refers to changes in an organisation's business model (Bessant and Tidd, 2013). Additionally, literature differentiates the level of innovativeness, addressing the two terms incremental and radical innovation. An incremental innovation is defined as an innovation that provides refinement and enhancement of existing products or production systems in the existing market (Garcia and Calantone, 2001; Reid and de Brentani, 2004). Contrary, radical innovation is defined as an innovation that embodies a new technology that either transforms existing markets or industries, or creates new ones (Colarelli O'Connor and Rice, 2013; Garcia and Calantone, 2001; Leifer *et al.*, 2001). Moreover, Leifer *et al.*, (2001) address radical innovation as a transformation in the relationship between customers and suppliers, as well as displacing current products, restructuring marketplace economics, and creating new product categories. Hence, there is a clear distinction between incremental and radical innovation, where incremental innovation is based on reinforcement of existing capabilities of established organisations, and radical innovation is based on developing new technical or commercial skills (Reid and de Brentani, 2004). Radical innovations are often related to high technical and market uncertainties, where questions regarding technical specifications of a product, customer wants and needs, methods for sales and distribution are important questions (Leifer *et al.*, 2001). Radical innovation is here defined as an innovation new to the firm.

Many large, mature firms have difficulties with finding the balance between being innovative and pursuing current practises (Dougherty and Hardy, 1996; Cooper, 2011). It is argued that one of the most important aspects when working with radical innovations is the underlying strategy. Firms can develop a radical innovation strategy (Cooper, 2011), or incorporate innovation as a meaningful component of the organisation's strategy (Dougherty and Hardy, 1966). Furthermore, Cooper (2011), Dougherty and Hardy (1996), and Leifer *et al.*, (2001) underpin the importance of leadership in large firms' innovation work, and how senior management should foster culture and climate that promotes and benefits innovation. Both Cooper (2011) and Leifer *et al.*, (2001) claim that if senior management does not have the will or the interest for radical innovations, the efforts will most likely fail. Authors further stress the need to allocate resources to innovation work, which require excessive time and energy (Leifer *et al.*, 2001; Dougherty and Hardy, 1996). Many authors suggest the use of champions and networks of entrepreneurial roles and relationships to facilitate the flow of resources for innovations (Dougherty and Hardy, 1996).

Different definitions of radical innovation have been reviewed. Radical innovation is in this study regarded to be a commercialised idea, process, or practise that the adoption unit(s) perceives as new. Furthermore, it has been suggested that large firms suffer difficulties with innovation work, with regards to being able to find the balance between being innovative and pursuing current practises. Here, the underlying strategy, leadership, culture and climate, allocation of resources and the use of champions and networks of entrepreneurial roles have been presented as ways to mitigate this problem. In order to mitigate it in the screening of radical ideas, these areas are in focus throughout the below text.

2.2 Front-End of Innovation – The Screening Process

This section aims to critically review existing knowledge regarding the structure and nature of the FEI, with a strong focus on idea screening.

The FEI is defined in slightly varying ways in academic literature. It is however most often explained in relation to new product development, NPD, as being at the very earliest stages of NPD projects (Khurana and Rosenthal, 1998: Koen *et al.*, 2002: Nobelius and Trygg, 2002: Reid and de Brentani, 2004). It is often termed *Fuzzy Front End*. But, as this incorrectly implies that it cannot be managed due to a too large portion of uncontrollable and unknowable factors (Koen *et al.,* 2001), it will here be denoted the FEI. The FEI will in this report be defined as by Koen *et al.,* i.e. "*… those activities that take place prior to the formal, well-structured New Product and Process Development*" (Koen *et al.,* 2001:46). It includes all time and activity spent on an idea prior to the actual start of the project, where a proper budget and other resources have been assigned to it (Nobelius and Trygg, 2002). The FEI is characterised by search for more information, iteration of initial ideas, and exploration (Bessant *et al.,* 2010). Since the nature of the FEI is different to the one of NPD, authors advocate that these should be studied and managed differently (conf. *exempli gratia* Martinsou and Poskela, 2009). Various representations of the FEI will be presented below.

Already during the 1980's, Cooper (1988) advocated that most of NPD success and failures lie in the projects' predevelopment activities. The FEI is today widely known to have high importance for NPD success (conf. *exempli gratia* Koen *et al.* 2001; Langerak *et al.,* 2004; Reid and de Brentani 2004; Martinsuo and Poskela, 2009). That is important, as companies are faced with increased competition, shorter product and technical life cycles, and rapidly changing market environments (Langerak *et al.,* 2004). The FEI directs the paths of product developments, can ultimately bring competitive advantage to the company, and are the activities related to NPD that can generate time savings with least expenses paid (Reid an de Brentani, 2004). The FEI underpins a company's capacity to adapt to changes, learn, and reach strategic renewal, hence equipping the firm to successfully handle future changes (Martinsou and Poskela, 2011). To understand how to do this successfully becomes increasingly important as the FEI also incorporates strong degrees of uncertainty, increasing with the radical-level of the innovation, and is unstructured, unpredictable (Reid and de Brentani, 2004: Langerak *et al.,* 2004), and the most troublesome part of development

projects (Martinsou and Poskela, 2009). Hence, many firms explore a set-up with having the FEI as an alternative structure for ideas new to the firm, outside the ordinary development processes, led by expert teams having experience of selecting radical ideas (Bessant *et al.,* 2010). One very important part of FEI literature that needs more attention is the process of idea screening.

Opportunities and ideas are the origin of all innovations, and contribute greatly to the potential of firm success. They are however also very early, only fuzzy, solutions to problems, whereby they need to be taken through a process where risk and success can be calculated. All ideas can obviously not be realised, whereby it becomes necessary to have procedures for screening and execution (Boeddrich, 2004). Idea screening is most often the step taken after idea and/or opportunity generation and recognition. In this research, it defined as by Rochford (1991), stating that *"The screening process evaluates the new product ideas identified during the idea generation stage in order to devote the firm's resources to only those worthy of additional attention"* (Rochford, 1991:288), with the addition of process and services innovation types. Screening is a critical activity in the FEI, to ensure that the decisions are the best for the company (Martinsou and Poskela, 2009: 2011). It provides consistent knowledge about the possibilities, and eases the process of comparisons of alternatives based on company interest, rather than merely the product itself (Martinsou and Poskela, 2011).

Traditional screening processes for incremental ideas, focusing on risk management with decisions made based on market and technological facts, are insufficient to use for vague and speculative, i.e. more radical, ideas. This as specifics regarding specifications, performance and time are not, and should not, have been, set. There is a fundamental difference in uncertainty level (Martinsou and Poskela, 2011: Reid and de Brentani, 2004). Due to its exploratory and iterative nature, the success of the FEI should be measured with criteria that are adapted to its specific nature (Bessant *et al.,* 2010: Martinsou and Poskela, 2011). The process of selecting discontinuous ideas regards more than selecting a portfolio of ideas based on risk: one chooses what to do, and why those things out of all the other options (Bessant *et al.,* 2010). The quality of an innovative idea is in creative idea generation literature normally defined as a combination of originality and feasibility. Originality relates directly to creativity, whereby there is a value in unusual idea. However, there is still a need for some sort of relevance and feasibility for it to practically be implemented (Rietszschel *et al.,* 2010).

2.2.1 Structure

This sub-chapter will present literature regarding the structure of the idea screening process. Many authors' varying models represent screening within FEI structures (Boeddrich, 2004; Cooper, 1988; Koen *et al.,* 2001; Gaubinger and Rabl, 2014). The ones presented here are combined as Cooper (1988) and Koen et al. (2001) are often cited in literature – the former provides FEI's relation to NPD, and the latter focuses specifically on the FEI – whilst Boeddrich (2004) and Gaubinger and Rabl (2014) provide more up-to-date representations. They are all further based on empirical evidence, whereby they together provide a holistic representation the screening process suitable for the aim of this report.

Gaubinger and Rabl (2014) point out that sequential models provide easy access of recommendations and predictability, whilst they may not represent companies' reality. Authors recommend firms to parallel the activities in these sequential models, so that the process is sped up, and as parallelism and integration of external stakeholders seem to be a central success factor in the FEI (Gaubinger and Rabl, 2014). It is important to note that some authors below refer to screening as the first evaluation of ideas after idea generation, and not as evaluation of the idea through additional information gathering that takes place in the FEI (conf. *exempli gratia* Cooper, 1988: Boeddrich, 2004). This report however aims to understand the *evaluation process* of radical ideas throughout the FEI as defined by Rochford 1991, rather than an initial gate. Especially as the report focuses on radical innovations, often requiring more evaluation. However, the word is below used as by each author so to represent their view.

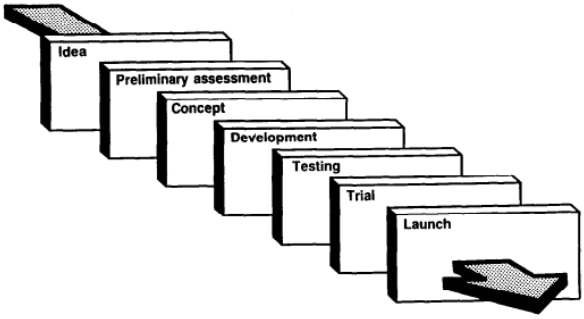


Figure 2-2. The Seven-Step New Product Process (Cooper, 1988:242).

Cooper (1988) provided a foundational model of a stage-gate process for NPD after reviewing companies' NPD projects, where stage 1-3 represents the FEI, see figure 2-2. The FEI is separated with gates where go/no-go decisions are made based on increasing information, and the idea's transition to a full concept (Cooper, 1988).

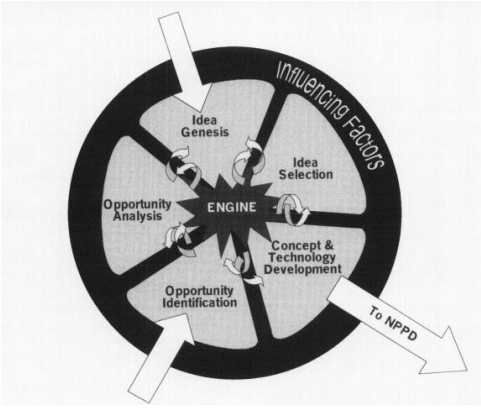


Figure 2-3. The New Concept Development Process, NCD (Koen *et al.,* 2001).

Koen *et al.* (2001) also presented a view of the FEI, with both similarities and differences to Cooper's (1998), see figure 2-3. In contrast to the stage-gate model of Cooper, opportunities and ideas are here expected to iterate in a random fashion and be continuously influenced by external factors. They also add how the FEI is influenced by leadership and firms' culture, and the environmental factors organisational capabilities, business strategy, enabling science, competitive

landscape, and the outside world. The latter needs to be understood for a successful FEI, so projects fall within the firm's capabilities, are of strategic value, and as technology often advances by building on earlier activities. Further, the NCD includes development of both processes and products (Koen *et al.,* 2001). Both writers (Cooper, 1988; Koen *et al.,* 2001) explain screening in three parts, presented below.

Phase 1

Cooper (1988) explains that ideas are initially generated and tentatively evaluated in stage 1, *Idea*. Then, firms make an initial selection of what new product ideas to further investigate at gate 2. The latter should according to Cooper (1988) be established as a formal step with a go/kill decision point. This is a tentative decision of whether initial resources should be allocated for assessment of the potential and viability, where the most realistic and easily used approaches are not portfolio ones, but benefit analyses using checklists and scoring models. Screening should be viewed as culling activities and should initially only leave out obvious losers and misfits. First, easily answered 'must' criteria required for further consideration should be used, that eliminates several ideas, including strategic alignment, feasibility, project size and criteria specific to the firm. Then, the passed projects are assessed through 'should' criteria, which are desirable yet not vital, and include market attractiveness, synergy and fit with firm resources and experiences, product advantage and profitability approximations (Cooper, 1988). Koen *et al.* (2001) also explains screening as a culling activity, but however adds that the *Opportunity Identification* includes business and technology identification possibly discovered by default, and is often driven by organisational goals. Then, additional information is gathered through of *exempli gratia* focus groups, market studies or scientific experiments in the Opportunity Analysis. Further, even though idea screening most often follows idea generation, it can also inform back to generation (Koen *et al.,* 2001).

Phase 2

Cooper (1988) and Koen *et al.* (2001) then similarly speak of a continuous information gathering, in *Preliminary Assessment* and *Opportunity Analysis* respectively, see figures 2-2 and 2-3. Cooper (1988) explains how more substantial, pre-specified resources are spent on collecting information for a preliminary market assessment, technical assessment, and evaluation. Market information of competition, growth, size and segments, product acceptance, and marketing strategy for the new product is gathered. The technical assessment includes technical staff's assessment, with focus on the technical viability and cost for manufacturing and development (Cooper, 1988). Koen *et al.* (2001) similarly explain the aim as to translate identified opportunities to specific business and technology opportunities, which includes uncertain, early assessments. They add here that hard, quantifiable templates that companies apply in new product and process development are usually not applied in this element. Rather, it includes trend analyses, competitive intelligence and assessments of early opportunity attractiveness, fit with strategy and culture, and decision makers' risk tolerance (Koen *et al.,* 2001). Cooper's (1988) next gate is a second evaluation, after which some projects move into stage 3.

Phase 3

This phase should according to Cooper (1988), who calls it *Concept Definition,* end in the final go/kill decision through a defined product strategy and outline of a product concept in relation to competition, focusing on customer benefits and perceptions. Cooper explains it to include market activities to identify the concept and customers' ideal product, through *exempli gratia* face-to-face and frequent interaction with potential users. Another important input is a competitive analysis presenting competitors' strengths and weaknesses of products, and their pricing and marketing strategies. Thereafter, the concept is developed through the translation of market requirements to operational concepts that are technically and economically feasible, involving marketing and technical staff. A final test of the concept should then be made, as design changes here still can be made to small costs. The concept is introduced to potential customers, and the test considers their reactions through *exempli gratia* slide shows, models or sketches. The final decision is then made, including a financial analysis, ending in a protocol of agreement between marketing and technical staff. It outlines the positioning strategy, target market, product benefits, attributes and requirements (Cooper, 1988). Other authors however (Koen *et al.,* 2001: Rochford, 1991: Boeddrich, 2004) emphasise that customer interactions should be introduced earlier.

Koen et al., (2001), naming this part *Idea Genesis*, explain that opportunities here move into being actual ideas that are concretised, through an *"evolutionary process in which ideas are built upon, torn down, combined, reshaped, modified, and upgraded "* (Koen et al., 2001:p.51). They add by stating that this is, in companies, often represented by iterations and changes, and includes direct contact with users, cross-functional team linkages, and collaborations between firms. The element often results in a more completely developed description of the product concept or idea (Koen et al., 2001). Firms then select with what ideas to pursue, through informal individual choices or formalised *exempli gratia* portfolio methods. However, due to limited understanding and access to information, a more formalised process is difficult for firms to achieve. Areas to consider are level of investments, technology and market risks, organisational capabilities, competition, and financial return. Lastly, a business case is developed based on estimates on market potential, customer needs, technology unknowns, project overall risk, competitor assessment, and investment requirements (Koen et al. 2001). Cooper (1988) states that the product should be defined through its positioning, offered benefits, and design, and that the endeavour should have been evaluated from the perspectives of manufacturing, financial, marketing and technological standpoints (Cooper, 1988). Depending on the idea's nature (i.e. whether it regards technology, platform or market opportunity), resources required and the business culture, firms use varying degrees of business case formality. Regarding projects of high novelty, where *exempli gratia* entirely new technology platforms are evaluated, the beginning of the FEI is often unstructured (Koen et al., 2001).

Reflections on theory

The two articles hence describe the screening process in the FEI quite similarly. It is a culling activity based on increasing information during the process, which aids in the evaluation of opportunities and ideas through the development of a business concept. It is described as including three overarching parts, ending in the selection of ideas. However, Koen *et al* (2001) add some additional

important insights to the earlier work of Cooper (1988). This is important as Gaubinger and Ralb (2014) point out that sequential models may not represent firms' reality. The FEI should not be seen as a harsh stage-gate model, but it is important to emphasise its iterative nature, with increased uncertainty and less structure the more radical an idea is. Koen *et al.* (2001) also emphasise the importance of considering that the generated ideas often are influenced by organisational goals, and that external factors and the company culture affects the screening from the outside.

Adding to the above, Boeddrich (2004) further validates the screening process as having three main parts, but also emphasises the importance of low formality where the FEI allows for creative idea loops. His empirical studies showed that it is where highly creative employees are allowed to play with fuzzy and weird ideas in loops that creativity really is tapped into (Boeddrich, 2004).

Gaubinger and Rabl (2014) further discuss the FEI and screening process' need for flexibility and creativity, and propose a framework based on the above models combined with newer research, which is adaptable to the type of innovation and its newness level, see figure 2-4.

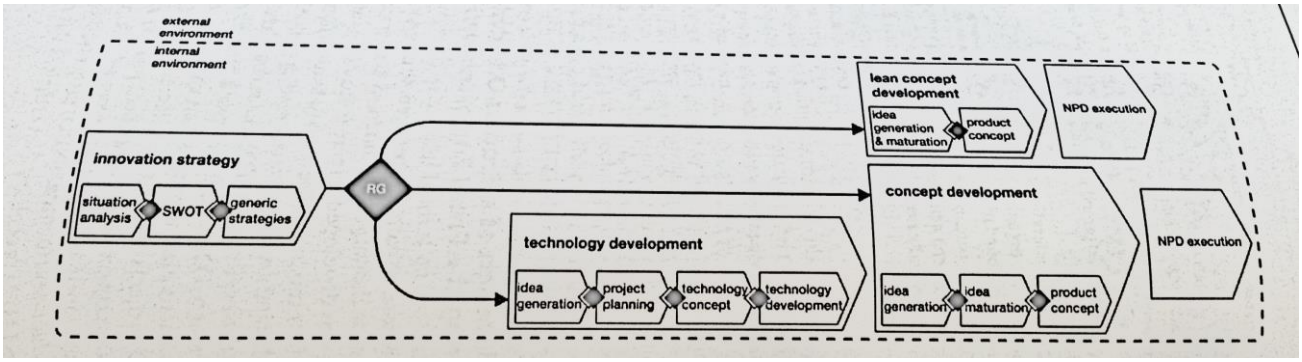


Figure 2-4. Holistic framework for the front-end of innovation (Gaubinger and Rabi, 2014: 22)

The *Innovation Strategy* is optional, and should be used for strategic oriented opportunity identification. The technology development is in turn suitable to use when the output of the strategy phase aims to develop new technologies. There are two concept development processes, as empirics and literature shows that one innovation process model does not fit all projects. Further, the process need be adapted to the newness level of the project, where major new product or platform developments need go through more stages and gates. This is decided at the routing gate, RG.

In the screening of generated ideas, the technical feasibility, prospective market success and the contribution for reaching the goal should be evaluated. The product conceptualisation then incorporates multiple phases of filtering where ideas are selected. This should be started of by a very rough selection characterised by a very low degree of specification, using tools such as oral assessment, checklists, and utility analysis. The process should use criteria of marketing and technical feasibility. Following, the product needs further specification through conceptualisation, ending in a product brief (Gaubinger and Rabl, 2014). Is seems to be like stated by Nobelius and Trygg (2002): firms need to stop chasing *the* FEI model and realise the importance of that it is adaptable and flexible.

The chapter has shown that authors view the end result of an evaluation process as being a concept developed in more detail than when the idea originated, which is further validated by Leifer *et al.,* (2001) and Reid and de Brentani (2004). Some state that this concept should be a fully developed product concept (Cooper, 1988: Martinsou and Poskela, 2011), whilst others write of business concepts and/or project proposals (Boeddrich, 2004: Koen *et al.,* 2001: Martinsou and Poskela, 2009). This shows the emphasis on that the gathered information should aid in lowering the uncertainty in making an investment decision (conf. *exempli gratia* Boeddrich, 2004). However, it is not suitable to state it to be only a 'product' concept as this is not suitable for all types of innovations. Hence, the end result of the FEI and evaluation process is seen to be a more detailed business concept adapted to the type of innovation at hand.

Control vs. Flexibility

A constant battle between systemisation and creativity is at the centre of FEI management. One must find the suitable balance between flexibility and creativity (i.e. weak-defined processes and targets), and structure and bureaucracy (well-defied processes and targets). These have a U-shaped causality (Gaubinger and Rabl, 2014). There is a conflict of this in literature and between management. On the one hand, authors and managers stress the importance of clear and challenging strategic development goals, and the positive effects of communication and coordination, whilst some state that control drastically reduces creativity (Boeddrich, 2004: Martinsuo and Poskela, 2009). Boeddrich (2004) exclaims that both ends of the continuum are *"imperfect and doomed to failure"* (p. 275). Focus is however needed for idea generation and concept development to be useful to firms, so it can be optimised, and to avoid poor strategic adjustments, waste of emotional and physical resources, and time (Boeddrich, 2004). As Bessant *et al.,* (2010) note, the deployment of innovation practises for both incremental and radical innovation is likely to create tensions and conflicts inside the organisations, whereby many firms choose to operate radical projects separately or in parallel to the normal organisation (Bessant *et al.,* 2010).

Martinsou and Poskela (2009) have studied formal and informal control mechanisms' role and impact on strategic renewal in the FEI. Input control, primarily done by defining the FEI task and allocating resources for the development intervention, was shown to be necessary for medium and large sized companies to reach strategic renewal in the FEI. Specific and challenging goals lead to higher performance on routine environments, whilst formalisation of the FEI and output-based rewards seem to have negative impact if the technology uncertainty is high. Here, much freewheeling is needed for the right decision criteria and direction to be found, and participants are prone to take less risk if an output-based reward system is in place. This is not shown to be the case for high market uncertainty, however (Martinsou and Poskela, 2009).

There are similarities in varying authors' representations of the FEI. It is constituted of several activities, focused on information collection to build a concept of more detail and less uncertainty. This so that a decision can be made of whether to allocate more resources to the concept in an NPD project or not. The FEI includes the generation, evaluation, conceptualisation and selection of innovative ideas, and should due to its uncertain nature be managed differently than NPD projects. Its uncertainty increases with ideas' radicalness level, whereby firms experiment with having it as an alternative structure from their set processes for new-to-the-firm and discontinuous innovations.

Idea screening is denoted differently within the literature. It can however be concluded that, in order to understand the process needed to select the ideas that should proceed into NPD, one should define screening as the iterative and continuous evaluation process of the idea, and not a one-off selection. As the idea is changed and redefined throughout the FEI, the development of the idea should not be taken away from the word screening. This, as ideas will not be screened similarly throughout the FEI process. Therefore, idea screening is the continuous culling process of presented ideas through increased information, evaluation, development, and selection.

In figure 2-9, presented in chapter 2.2 Front End of Innovation – The Screening Process, which compiles the above findings of screening, it can be seen that writers represent screening in three steps, which is further in line with Rochford (1991). As this research focuses on radical innovations, phase 2 should be seen as an iterative and explorative phase with an undefined number of stages and combinations of methods to reach the business concept. The process needs to be flexible and adaptable to the company, and the innovative ideas' nature – in terms of newness level and information needed. However, there is a tension between control and flexibility in the FEI that needs to be managed. It seems that formalisation of the process is positive, but the need for flexibility and iteration increases with the newness level of the idea, especially when uncertainty lies in the technology rather than market application.

It should be noted that the literature takes the standpoint of product development, and some process development. Hence, there is a risk for it not to be perfectly aligned for service development, highlighting a theoretical gap. It also becomes interesting to understand to what extent the FEI and screening can be formalised, due to its uncertain and unpredictable nature, and the many differences in innovation nature.

2.2.2 Methods

There are numerous methods used in large firms today to evaluate and choose ideas for potential radical innovation in the FEI (Bessant *et al.,* 2010: Martinsou and Poskela, 2011). The common understanding within FEI literature is that a combination of qualitative and quantitative methods should be used, that also allows for comparisons of various different criteria (Martinsou and Poskela, 2011). Depending on the number of screening stages, one or several methods may be used

by the firm. Initially, during the earliest screenings, qualitative yes/no methods can be used, followed by more detailed and quantitative methods later on. The combination of methods used at a particular firm will be influenced by realism, flexibility, capacity, ease of use, and cost considerations (Rochford, 1991). Bessant *et al.'s* (2010) analysis of 150 firms' selection process of discontinuous innovations, i.e. new to the firm or higher newness-level, derived three themes companies regard during evaluation. These are presented below, and should be seen as complementary, since successful managers have been shown to use a portfolio of them (Bessant *et al.,* 2010).

The role of processes: Apart from having the FEI process for radical innovations in alternative structures with expert teams, employees outside the R&D departments, and in some set-up customers, should be included in selection of radical ideas. This is *exempli gratia* done via crowd selections through idea markets, where ideas are traded with values like the stock market, and through innovation contests. Further, firms increasingly include senior managers, since they have the authority to take go/no-go decisions and also experience, as idea juries with larger evaluation groups for selection of discontinuous innovations. Popular ways of doing this in firms are through an internal Dragon's Den, presentation rounds, internal stock markets and open innovation evaluations. Ordnance Survey, *exempli gratia*, periodically gather senior managers to assess competitive funding bids, where ideas firstly are assessed by criteria by innovation angels, who then help the innovator for a time period to help them prepare to present to the managers. O2 uses presentation rounds, without initial use of criteria, where successful projects are allocated a champion (Bessant *et al.,* 2010). Additionally, Bessant *et al.* (2010) point of the need to develop organisational ambidexterity for discontinuous innovations (Bessant *et al.,* 2010).

Experiment, the role of tools and methods: One primary challenge in the evaluation process for firms is to see the world through other lenses, so that alternative arrangements are made possible. This can be helped through use of methods such as scenario planning, trend extrapolation, storytelling, metaphors and vision building. The latter three are used by *exempli gratia* BMW and Nokia to open up for innovation (Bessant *et al.,* 2010). Other strategies firms use to experiment and step outside their mind map is so-called probe-and-learn strategies: take enough small steps into the unknown to shed light onto what lies ahead. It i.e. means to experiment deliberately. This is often done through prototyping, frequently used by *exempli gratia* Nokia and the BBC, but all methods use have in common of being deliberate experiments in the unknown (Bessant *et al.,* 2010).

The role of individuals: The important role of champions, widely identified in literature, highlights the challenge for companies to see to that they are engaged in idea evaluation in a planned fashion. Champions can take the form of both knowledge champions, bringing expertise, and power promoters adding resources and backing. One approach to ensure champion engagement used in firms today is to establish formal links with senior managers that are allocated the task of being sponsors to projects to support and advise them. Companies also identify and allocate employees with high-profile reputation (Bessant *et al.,* 2010). Related to this is the negotiation in management

board and committees, which is an essential part of firms' idea selection (Martinsou and Poskela, 2011).

In (2011), Taherian conducted a theoretical review of existing methods that can be used to screen radical ideas, of which some are not already mentioned in this text. For go/no-go decisions and revealing uncertainties, he presents the use of criteria within areas of feasibility, profitability and size, the Real-Win-Worth Screen Matrix, see fig 2-6, or to use a business model.

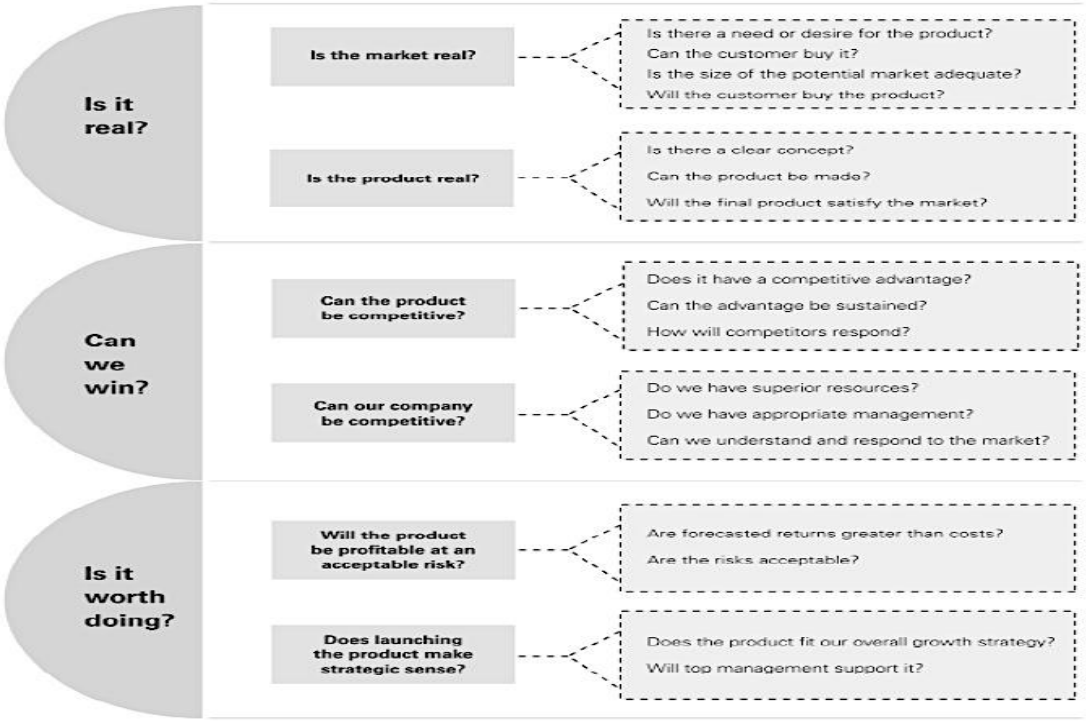


Figure 2-5. The Real Worth Win Matrix (from Taherian, 2011:13 - Day (2007))

When selecting radical innovation projects, Taherian presents several models and tools that can be used. Firms can use portfolio management, which helps ensure that they set a limit to undertaken projects, dare to kill projects, set a strategic focus, and develop successful selection criteria. One model of this can be seen in figure 2-6, which is based on O'Connor *et al.* (2008). It considers market, technological and organisational fit, and time. Firms can also use a risk matrix, considering the project's novelty and probability of failure, see figure 2-7 Z (Taherian, 2011).

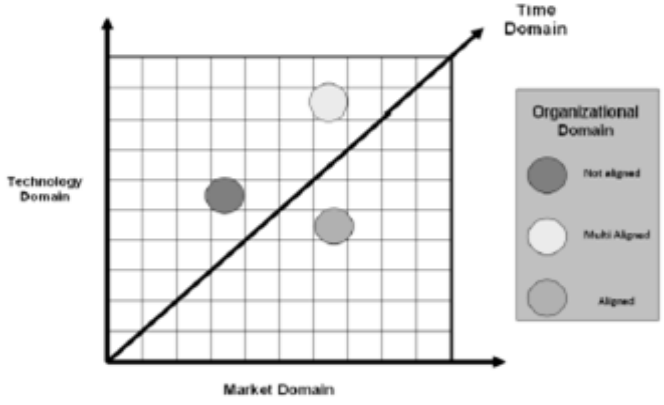


Figure 2-6 Portfolio Management (from Taherian, 2011:15)

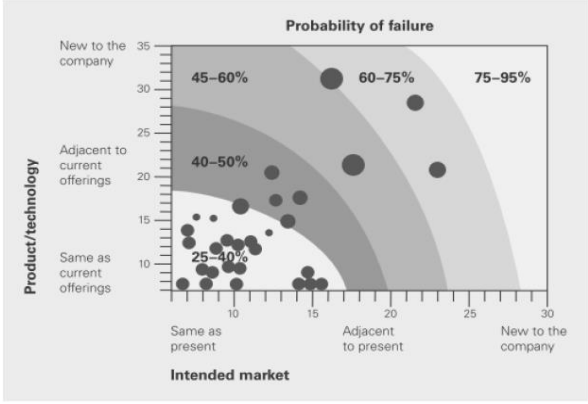


Figure 2-7. Risk Matrix (from Taherian, 2011: 16)

Critique of various methods usually focuses on the subjective nature of *exempli gratia* scoring models and checklists. Rochford (1991) emphasises that the information available at early stages is limited, whereby management's opinions may be the only information available. She further argues that the objective with initial screening is not an in-depth analysis, and hence states that this critique is unwarranted. She additionally points out that ideas that are discarded should somehow be saved for future use, as changes may take place in the market or technology situation making those ideas valuable (Rochford, 1991).

Reflections on theory

There are many methods available for firms to use when screening ideas of high novelty. Depending on the number of screening stages, one or several methods may be used by the firm. Initially, during the earliest screenings, qualitative yes/no methods can be used, followed by more detailed and quantitative methods later on. It has also been shown that successful firms use a combination of methods that cover three areas: the role of processes, methods and tools to experiment and measure, and to ensure inclusion of needed individuals. The combination of methods ought most probably to include these three aspects. A list of tools and methods used by firms mentioned throughout the text, apart from those presented from Taherian (2011), can be round in Appendix III. A conclusion of implications for employee and management inclusion will be presented in the conclusion text under chapter 2.2.4.

2.2.3 Criteria

The use of criteria have been seen to positively and clearly promote competitive and business potential in the FEI, independent of the product complexity, as well as mediating the link between strategic opportunity and product complexity. It is important to consider different criteria's associations with varying strategic opportunities, whereby they need be holistic in an informal assessment setting. The criteria use in the firm need also be adapted to be in line with its development objectives, and the evaluation process aims to focus on projects that bring strategic potential, i.e. competitive and future business potential (Martinsou and Poskela, 2011).

A number of criteria are often used to evaluate ideas in companies, to aid in comparing ideas and projects with each other, and the company's strategy. They usually regard areas of technology/feasibility, market/customers, financial assessments, strategy/objectives, and other project specifics. A compilation of all encountered screening criteria mentioned within these areas is presented below, see table 2-1. The criteria that will be used for screening ideas should be developed before these ideas are generated. Authors argue that the harshness level of criteria should increase over time, but the extent to which this should be done is not explicitly stated (conf. *exempli gratia* Cooper, 1988: Rochford, 1991, Koen *et al.,* 2001). It is also important to consider that for more radical innovations, entering new markets with new technologies, one must allocate the longer time needed to bring the required knowledge into the firm (Martinsou and Poskela, 2011). The selection of creative ideas can be enhanced by instructions on creativity specifically for the selection, which does not make people select less feasible ideas. When both feasibility and

originality is asked for, participants perform better when given only creativity instructions (Reitzschel *et al.,* 2010).

A market orientation, i.e. to incorporate market information into the process, has been proven to increase FEI success. It helps in making departments' and individuals' project efforts more unified, as it provides them with a common direction and holistic approach, which aids in lowering the level of 'fuzziness' in the front-end phase. Companies need to understand customers' needs and wants, so that products are chosen that offers superior benefits and value to customers. This needs to be done before projects are chosen and initiated, whereby it means to decide the product concept and conduct market research of customer wants and needs before the project is decided upon, i.e. during the FEI (Langerak *et al.,* 2004). Related to this, Reid and de Brentani (2012) emphasise that a clear market vision also helps the firm to keep a common focus when it regards a new market application for an advanced technology, and that market visions competence is needed to successfully develop radically new, high-tech products (Reid and Brentani, 2004).

Strategy and vision

In the above discussion regarding innovation in chapter 2.1, it became clear that many authors stress the importance of strategy in innovation work for firms to mitigate risks and strike the right balance between incremental and radical innovation work (*exempli gratia* Cooper, 2011; Dougherty and Hardy, 1996). Hence, this section will deal with this subject in more detail in relation to use of criteria in screening, with complementary literature form the field of strategy.

Strategy is often described as management's deliberate plan for a firm's future actions, as a pattern in a stream of decisions, where strategic decisions are crucial as they strongly shape a company's course (Eisenhardt and Zbaracki, 1992; Mintzberg and Waters, 1985). However, due to that *exempli gratia* not all actions are intended, and external factors influence, the realised strategy over time falls between the continuum of deliberate and emergent strategy. Hence, management need both direct the strategic actions and simultaneously allow for responses to unfolding patterns (Mintzberg and Waters, 1985). Burgleman (1983) adds to this as he describes how strategy both sets the firm's structure and is influenced by it, and that the combination of these provides different firm typologies. Induced strategic behaviour uses inputs from the firm's current strategic direction in order to identify opportunities, leading to *exempli gratia* NPD for current lines of business and providing criteria for project screening. This unfolds in less project variation and makes the company less prone to new changes or opportunities, but is however often the focus of top management as it provides predictability through planning. In the latter, strategy is a process where entrepreneurs at the firm's product/market- level provide inputs. Projects based on these are highlighted by middle management who are affected by politics and rewards. Autonomous strategic behaviour defines opportunities by introduction of new categories, where new business opportunities are seen and pushed by idea champions and efforts are put into receiving top management's attention (Burgelman, 1983).

In FEI literature, the business strategy is often explained as influencing all activities in the FEI. Koen *et al.* (2001) advocate that both FEI and new product and process development need be aligned

with business strategy, as this ensures an uninterrupted, flowing pipeline of new products and processes with value to the firm. Indeed, the idea selection strategy is often influenced by previously set new product strategy, defining market types, technologies, applications and products on which the firm will emphasise its efforts (Boeddrich, 2004; Reid and de Brentani, 2004). Decisions regarding target markets, value propositions, product costs, and product functionalities are made at the screening stages, and need serve the best interest of the company and fulfil its long-term strategic objectives. As they direct future development activities, it is of importance for management to communicate clearly the organisation's expectations on the strategic levels (Martinsou and Poskela, 2009). The FEI should then link business and product strategy with product specific decisions. Thereby, the FEI must be holistic and consider elements as product strategy and the development portfolio (Khurana and Rosenthal, 1998). Idea evaluation includes the most strategic decisions of setting goals and allocating resources and money for development projects, whereby assessment of the idea and the concept should relate to the firm's strategy. This can also be done from a portfolio perspective, where projects should be aligned with the strategy so that the portfolio combined has a maximized value (Martinsou and Poskela, 2011). Similarly, Rochford (1991) advocate that strategic planning, i.e. determination of innovation needs and field(s) of search directs generation, collection, and screening of ideas before the business analysis, establishes a direction of the early innovation process (Rochford, 1991). According to Gaubinger and Rabl (2014), the FEI becomes inefficient without a clear innovation strategy stating the firm's long-term innovation goals, which objectives should be derived from the overall corporate strategy and be specifically linked to the marketing strategy.

When an idea however regards disruptive, i.e. new-to-the-world, innovations, Reid and de Brentani (2004) advocate that the order of the FEI phases should not be product strategy to generation to screening, but reversed, as these will most probably lie outside the current company strategy. These kinds of ideas may not make any sense in relation to current markets or competencies. Radical ideas ought to instead be seen as input that directs emergent strategies that should be interconnected with the current strategy rather than align directly (Reid and de Brentani, 2004). Academic literature does not conclusively present to what extent an innovation project should be separated from the core business, but some argue that discontinuous innovation cannot be successful inside incumbent firms as they lack the skillset to pioneer new markets. However, the strategic fit is used by firms to determine whether the idea should be part of existing business, a new business unit, or should be spun off. Many firms also understand that radical ideas are best developed unattached to the core business, where *exempli gratia* Siemens use small firms and act as incubators, and Unilever has a quasi autonomous division responsible for selecting and investing in discontinuous opportunities from within and outside the firm acting like a VC with fixed budget (Bessant *et al.,* 2010).

Reflections on theory

In accordance with above findings, screening through criteria is stated to be a culling activity with harsher and more extensive criteria at the end of the process. Overall, it is important to notice that the use of criteria is applicable to several, if not all, methods presented above. Firms apply a number of criteria within the areas technology/feasibility, market/customers, strategy/objectives, and project specifics. The use of criteria is said to be useful for all innovations regardless of

innovation newness level. The difference lies rather in the time and effort needed to gather information in order to answer the various questions, and the detail level at which they can be asked due to uncertainty. Firms searching original ideas should specifically state that originality is wanted to be assessed by. It is important to consider different criteria's associations with varying strategic opportunities, whereby they need be holistic within an informal assessment setting. Criteria are often divided into must-haves and want-to-haves, where they can be weighted through the use of *exempli gratia* balanced scorecards. A market orientation, vision, and an innovation strategy influenced by the firm strategy are seen to be important input to the screening process and criteria use, as it provides direction and focus to the efforts for potential market applications and markets, and for bottom-up idea processes. Here, portfolio methods can also be used with advantage, as previously discussed. Strategy as an input is only discussed to not be as useful when regarding purely disruptive, i.e., new-to-the-world, innovations. However, it is interesting to highlight the discussion of emergent and deliberate strategies. As Burgleman (1983) states, strategy can dictate NPD, but it can also be dictated by innovation efforts and findings, depending on wanted firm typology. This affects the newness level firms reach in their new product development processes. Discussions regarding how this should be done, and to what extent, is however missing in literature reviewed. A collection of writers' criteria mentioned throughout the text can be found in Appendix III. An assembly of them is presented in table 2-1below.

Table 2-1. Criteria presented in literature to use for screening innovative ideas in the FEI (conf. Bessant *et al.,* 2010; Carbonell-Foulquié, 2013; Cooper, 1988; Gaubinger and Rabl, 2001; Koen *et al.,* 2001; Martinsou and Poskela, 2009: 2011; Rochford, 1991)

Technology	Market	Financial	Strategy	The project
Originality/uniqueness	Market attractiveness	Profitability approximations	Strategic alignment/fit	Project Size
Technical feasibility	Competition	Level of investment	Strategic priorities	Project risk
Newness level	Growth	Financial return	Long term/short term fit	Process limitations; time and budget
Fit with firm resources and experiences	Size	Investment requirements	NPD objectives	Firm's leadership and culture
Product advantage	Product acceptance	Product cost	Fits guidelines and missions	
Technical staff assessment	Marketing strategy	Benefit analysis	Business Strategy	
Technical viability	Outside world	Cost for manufacturing and development	Innovation strategy	
Technology risk	Market risk	Economically feasible	Vision	
Organisational capabilities	Market potential	Financial analysis	Product strategy	
Technology unknowns	Customer needs		Long term/short term opportunity	
Simply: Doable	Prospective market success			
Enabling science	Target market			
	Value proposition			
	Customer acceptance			
	Customer benefits			
	Competitive analysis: competitors strengths and weaknesses with product, pricing and marketing strategy			
	Environmental factors			

2.2.4 Stakeholders

Internal stakeholders' roles have been described throughout the text in relation to other topic areas, where both management support (Bessant, 2010; Cooper, 2011; Leifer *et al.,* 2001) and employee roles (Dougherty and Hardy, 1996; Reid and de Brentani, 2004; 2014) are discussed as very important. However, as it is of such importance, it requires more attention to fulfil this research's purpose. Throughout the review, it has been noticed that external stakeholders need to be considered when screening, where competitors and customers are mentioned as screening criteria, for example. However, there is a gap in the literature regarding *how* this should be done, and to what extent. As how to identify and consider other external stakeholders is not encountered in the FEI literature, it is not discussed within this chapter.

Employees

One important aspect to consider during evaluation is who to involve in the process, as the evaluation and development phase's success in part is dependent on the management process, skills, resources and knowledge of the group conducting it (Cooper, 1988). Team leaders should be able to lobby for resources, share a team's vision, lead the team, and have authority to influence the surrounding organisation. For the actual team, it is of importance for them to have the right knowledge base and capabilities to sufficiently do the job. Hence, companies should consider the representation of cross-functional expertise, as well as what success motivation and attitudes that are present. To foster radical innovation, it has shown that people with opposing opinions are of extra relevance (Martinsou and Poskela, 2009). Leifer *et al.,* propose an evaluation board composed of experts *"whose combined capabilities bring both credibility and wisdom derived from experience in evaluating radical concepts"* (2001: p.42).

It has been found that the personalities of the individuals who are involved in front-end of new business development, NBD, is equally important as the process itself (Stevens and Burley, 2003). Stevens and Burley (2003) further argue that individuals working with NBD in the front-end should have personality traits such as high-risk tolerance, creativity and openness to the irrational process of NBD (Stevens and Burley, 2003).

The team

Previous research has found that the setting of nominal groups in idea generation outperform that of interactive groups. A study confirming this also showed that there is no significant difference in the quality of selection of ideas of nominal versus interactive groups (conf. Faure, 2004). In nominal selection, participants discuss in groups each idea generated, but vote individually for which ones to take forward. However, as there is a need for consensus within organisations, a group selection may be preferable. Interestingly, much previous research has also assumed that the group generating is also the group selecting the ideas, and that the generation is a planned event (conf. Faure, 2004).

Another interesting perspective to take into consideration regarding the team is what Hoegl and Parboteeah (2006) call team goal commitment. This can be explained as a team member's attachment or determination to reach a collective team goal, regardless of the goal's origin. Further

described, this refers to when a team member takes personal responsibility for reaching a goal, rather than to view it as the team leader's goal. Moreover Hoegl and Parboteeah (2006) advocate that highly innovative projects depend more heavily on team goal commitment compared to less innovative projects. With this as a background, it is argued that there is a direct and positive relation between team goal commitment and team performance, i.e. efficiency and effectiveness, if the project is highly innovative (Hoegl and Parboteeah, 2006).

Management

As previously mentioned, many authors emphasise the need to involve management and gain their support in the FEI and the evaluation (conf. *exempli gratia* Bessant *et al.,* 2010; Koen *et al.,* 2001; Martinsou and Poskela, 2009). Boeddrich (2004) emphasises that managers need to pay full attention to the ideas, as they are very valuable thought to employees themselves. Otherwise, it may discourage interest in solving company problems and caring about company goals. He advocates a set-up of a virtual interface, as managers then will not be disturbed in their operational work, and problem-solvers will not be frustrated, because they know where to deliver their ideas (Boeddrich, 2004).

Hoegl and Parboteeah (2006) argue that there are variables that managers can control when leading and staffing the teams, which can increase team goal commitment and thereby team performance. Their extensive study of 575 managers, leaders and members of 145 software development teams, showed that participative decision-making, task feedback and team size (smaller) are related to higher team goal commitment in highly innovative projects. Moreover, the study showed that team-external obligations and team member's outcome interdependence do not relate to team goal commitment (Hoegl and Parboeeah, 2006). The knowledge gained regarding management involvement throughout the text is presented below under *Reflections on theory*.

Reflections on theory

The team and employees: The leaders of the team working with innovation screening need be able to lobby for resources, share a team's vision, lead, and have organisational authority. People of different opinions and knowledge should be present for radical innovation to be fostered. Further, the personalities of individuals working with FEI is of great importance for success, whereby they need be regarded when the team is put together. They need tolerate high risk, be creative and open to the irrational process. The team itself should be considered to have cross-functional knowledge, where the evaluation can be performed in both nominal and interactive groups. For radical ideas, it is important for team members to be personally committed to the goal, and not see it as the team leader's.

Managers: The managerial role has been discussed throughout the FEI literature presented above. Before this chapter, i.e. 2.4.4, it has been clear that managers need to decide the level of control and flexibility to be allowed in the screening process: if radical innovations are required, then a certain degree of flexibility needs to be allowed, with an acceptance for uncertainty. Higher management is seen to be involved in the screening process of successful, innovative firms such as

BMW, Nokia, Ordnance Survey and O2. However, they are not involved throughout the process. Rather, employees are allowed to develop a concept, which is in someway presented to senior managers so that decisions can be made through authority, and knowledge can be included through experience. Innovation teams or innovation managers can aid this. Higher managers are needed as both power and knowledge champions, whereby senior managers are linked through being sponsors to projects, giving support and advice. When evaluating, it is important that managers look at the long-term strategic value, and not just the short-term return.

There needs also be a management discussion of how innovation work can feed into formulation of future goals and directions. This so that new future opportunities discovered are not missed, and internal entrepreneurs can contribute to the development of the firm's future. To ensure a successful direction, it is of importance that managers communicate clearly the organisation's expectations on a strategic level. A budget need also be allocated that allows for iteration, prototyping and concept development. This chapter further emphasised the importance of managers to show interest in employees' ideas and innovation work. Managers should set up a small team, give task feedback and be part of some decisions also to heighten the innovation team's goal commitment.

Cross-functional knowledge is needed for those evaluating, and many writers emphasise the importance of champions and higher management's support to receive knowledge and decision power. It is however not clear exact how and to what extent higher management is needed, what knowledge is required from evaluator(s), if it is different for each evaluation time, whether the one(s) generating the ideas should also develop and choose them, or whether the same team should evaluate all the ideas. It is also not clear how ideas should be stored and learned from in later stages of the firm's life. Further, as it is emphasised that management is needed to bring decision power and action to the FEI, it is interesting to question whether management support is needed if the innovation team should be empowered.

2.3 Entrepreneurship – The screening process

The purpose of this section is to broaden the perspectives on idea screening and to gain insights that might be useful from the field of entrepreneurship. Hence, it follow the same structure as the chapter regarding FEI. The field of entrepreneurship is centred on opportunity recognition, evaluation and exploitation (Ardichvili *et al.,* 2003; Zara 2008). Additionally, successful entrepreneurs have the ability to select the right opportunities for new business (Ardichvili *et al.,* 2003). It is therefore believed to provide an insightful complement to existing FEI literature regarding idea screening, its structure, methods to use, and preferred personality traits of involved individuals in firms. FEI literature has also emphasised the possibility to learn from this field (conf. Bessant *et al.,* 2010; Dougherty and Hardy, 1966). It should however be noted that entrepreneurs develop business opportunities to create and deliver value for stakeholders in prospective ventures (Ardichvili *et al.,* 2003), whereby it needs be adapted to the context of this research.

There are different definitions of entrepreneurship but with very similar underlying argument. Entrepreneurship is a professional application of competencies, skills and knowledge to make profit on a new idea, by a set of people or by an individual. Their goal is to launch a new enterprise or to diversify an existing one, with the objective of growth whilst creating social good and employment (Veeraraghavan, 2009).

2.3.1 Structure

Similar to the FEI, the development of opportunities that are identified by entrepreneurs include three steps according to Ardichvili *et al.* (2003). These are opportunity recognition, evaluation, and the development *per se*. This development process is characterised by its cyclical and iterative nature, where concept development includes several evaluation stages that can lead to the acknowledgment of further opportunities, that the initial vision need be adjusted, or that the idea should not be taken further (Ardichvili *et al.,* 2003). Sarasvathy and Dew (2005) describe the phases of market creation as a process of exploration, which is explained as a process that includes, search, variation, experimentation, risk taking, flexibility, discovery and innovation.

Even though the terms opportunity *discovery* and *creation* are dissimilar, they can together build a dynamic virtuous circle, as discovered opportunities develop the platform of which further opportunities are created, which in turn can be the foundation and knowledge for increased discovery, and so forth. The circle will hence reveal gaps in technological competencies and resources needed to exploit an opportunity, and its importance has been recognised in corporate entrepreneurship for two decades. What however is important to notice is that the context in which this happens dictates the circles emergence and direction (Zahra 2008).

Entrepreneurs' initial business concept development is positively aided by a careful investigation of, as well as sensitivity to, suboptimal use of resources or new technologies, and market needs that are unfulfilled or can be better attended to. The former regards ideas related to basic technologies, inventions for which no market has been defined, or ideas for products and services. They can offer possibilities to create and deliver new value for prospective customers, even though the precise form that the new value may take place can be undefined. Through the process in which an identified idea is further developed, potential costumers may be unable to articulate the problems they have that the entrepreneur can solve. However, if they are presented with a value proposition and explanation of the value, they are able to recognise whether it is of interest to them. In the end, the development process should result in a business concept, which clearly outlines the benefits and value offered (Ardichvili *et al.,* 2003).

The opportunities' duration will vary depending on how easily they can be imitated, the knowledge that is required to extend the shelf life, and comprehensibility. Some scientific opportunities, e.g., are very hard for others to understand, but can be important to reinforce a company's competitive position and be worth the efforts as they are slowly imitated and provide learning and new technological foundations for increased opportunity creation (Zahra, 2008).

The entrepreneurial evaluation process is cyclical and iterative, and includes several evaluation stages similar to that of the FEI, whereby it is suitable to investigate further for additional insights. Heretofore, entrepreneurship has highlighted that an idea's ease of imitation and shelf life need to be considered. Further, it has become clear that depending on how much information there is available regarding technology and market aspects, hence the idea's newness level within these areas, different ideas require development with emphasis on either the areas market, technology or both.

The development process of opportunity discovery and creation builds a virtuous circle, where increased knowledge can lead to increasing discoveries, and vice versa. Hence, one must understand that generation and screening of ideas cannot always be distinct processes, but continuously inform each other.

2.3.2 Methods

There are several methods mentioned in the literature of entrepreneurship regarding how ideas should be developed and evaluated. The ones that will be presented below represent methods that are often cited within the field.

Effectuation

An interesting subject that can provide insightful awareness to the area of entrepreneurship is effectuation and bounded cognition. Effectuation has been presented by Sarasvathy (2001) and can be defined as taking a set of means as given and focus on selecting between possible outcomes and effects that can be created with that specific set of means. This is contrary to causation, which is based on taking a particular outcome as given and focus on selecting between means to create the specific outcome or effect.

Sarasvathy and Dew (2005) argue that effectuation and effectual logic is based on bounded cognition. Bounded cognition is a term that has gained momentum amongst economists and means that our planning horizon is short and that we can only attend to a few things at a time. Adding to this, it is said that knowledge is dispersed amongst many individuals, which causes it to not be fully accessible to everyone (Sarasvathy and Dew, 2005). With this as a background, it is said that the creation of a new market requires an effectual logic, which is non-predictive, non-adaptive and non-technological. This means that whoever comes on board is allowed to determine what the new market will look like, rather than to use vision predictions of the new market do drive the search and selection for members. One fact that affects this reasoning is the fact that customer tastes are ambiguous, ill-defined and evolving in new markets, which makes it difficult, or even impossible, to find or predict the potential market. Further, entrepreneurs work out ways to find means, leverage contingencies, use affordable loss and rely on stakeholder commitments, which eliminates the need for predictions and guesses of a new market, where the needs are unknown (Sarasvathy and Dew, 2005).

Lean Start-up and the Customer Development Process

A widespread saying in an entrepreneurial context is that no business plan survives first contact with the customer, whereby iteration and incremental delivery of the product or service is needed (Ries, 2011; Blank and Dorf, 2012; Sull, 2004). Sull (2004) argues that entrepreneurs should take a disciplined approach, by which he means that they should start with formulating a hypothesis, run experiments, revise the hypothesis and run another round of experiments. This is in line with theories suggested by Blank and Dorf (2012), who argue that the process for entrepreneurial ventures should not be sequential steps or a linear execution, but rather a Customer Development process to find the right business model. More specifically, this is an iterative process where the purpose is to test hypotheses with customers, to either verify or pivot them (Blank and Dorf, 2012). It requires a mind-set where the entrepreneur is open to changes, flexible early in the process and that they realise that the business model and the suggested hypotheses are subject to verification, modification or rejection when new information is received. Here one of the most important aspects is the fact that the entrepreneur should be solving a customer problem, want or need.

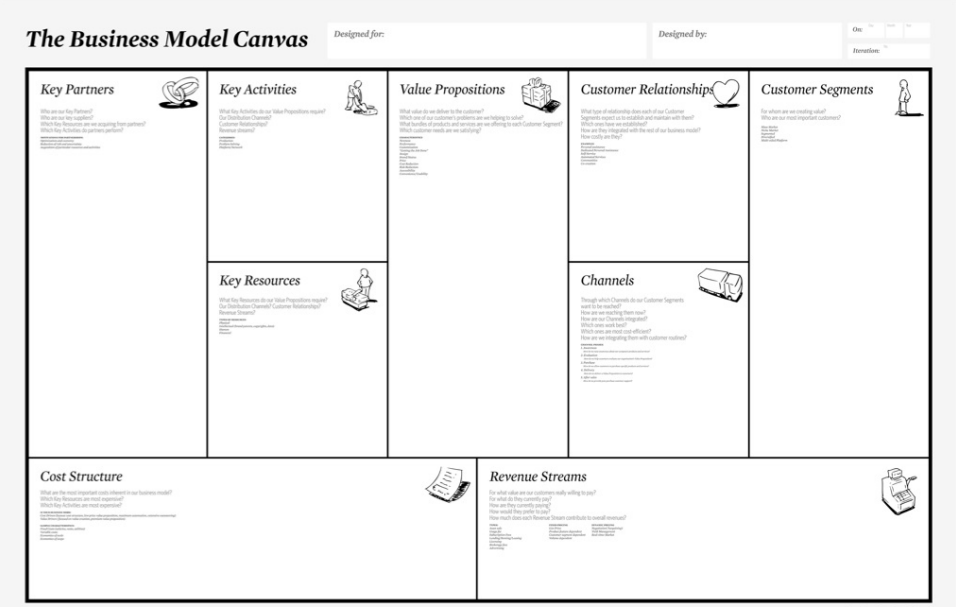


Figure 2-8. The Business Model Canvas (Blank and Dorf, 2012:94)

This implies the importance of anchoring the value proposition in a true, existing customer problem, want or need (Blank and Dorf, 2012; Sull, 2004). This further implies the importance of getting out of the building to turn the hypotheses into facts and to get customer feedback early in the process. More start-ups fail from a lack of customer base rather than failure in product development (Blank and Dorf, 2012). Furthermore, building a minimum viable product, instead of everything at once, is necessary to be able to gain the information and insights needed, but also to be able to iterate and make changes continuously as hypotheses are tested (Blank and Dorf, 2012; Ries, 2011). The Customer Development process is divided into four main phases, being customer discovery, customer validation, customer creation and company building. The first two phases are focused on the search for a business model whilst the two latter ones are focused on the execution,

which is when you believe that you have a product-market fit (Blank and Dorf, 2012). Finding a business model includes testing hypotheses regarding value proposition, customer segments, channels, customer relationships, revenue model, key resources, key partners, key activities and cost structure, see figure 2-8 (Blank and Dorf, 2012). The purpose is to test your understanding of the problem and get insights, not just data, and change the business model accordingly (Blank and Dorf, 2012). Blank and Dorf (2012) further argues that the founder should be the one to do the testing and experimenting for insights, since (s)he is the one with the vision and the drive to pursue the process.

The Customer Development process suggested by Blank and Dorf (2012) is very similar to an entrepreneurial methodology called Lean Start-up suggested by Ries (2011). They have the same general building blocks, which easily put are testing of hypotheses, meeting an actual customer need, a process of iteration, building a minimum viable product early and the importance of realising that it is a learning process that requires flexibility and the need to not commit too early to a business plan (Blank and Dorf, 2012; Ries, 2011). What both Blank and Dorf (2012) and Ries (2011) argue is the need for entrepreneurs to realise that entrepreneurial ventures are ventures with extreme uncertainty and a rife of failures, where one of the most important things is the necessity to test and then pivot if needed, rather than to stubbornly launch a product/service or to fire people because they do not match the existing model. Fire the model, not the people (Blank and Dorf, 2012).

Agile Software Development

The Customer Development process and the Lean Start-up methodology are both similar to what is called Agile Software Development. It is a group of software development methods based on an iterative and incremental development process, used within established software companies. The focus lies on individuals and interactions rather than processes and tools, working software rather than comprehensive documentation, customer collaboration rather than contract negotiation and finally being able to respond to change rather than to follow a plan (Dingsøyr et al, 2010). The core principles of Agile Software Development address the importance of satisfying customers needs early and to welcome changing requirements, even if they would appear late in the development. The iterative nature can allow this to happen and will harness from it. Agile Software Development also deploys the need to build projects around motivated individuals, to trust them regarding getting the job done and to give them the support and environment they need (Dingsøyr et al, 2010).

Reflections on theory

Effectuation and the theories behind it are interesting when discussing idea evaluation and how it can be optimised. The insightful part of this is maybe not the detailed way of working with effectuation, but rather the mind set, where customers might not be aware of their needs and wants and entrepreneurs need to focus on the underlying problem. The discussion allowing firms to create the future rather than to try and achieve a specific scenario, which quite clearly changes the outset for idea evaluation, is however here seen to rather be applicable to highly radical ideas that are not only new to the firm, but where no current or similar market can be found.

The three remaining methods presented above are iterative processes with a focal point of finding the right customer problem as a basis for building a business model. It is done through *exempli gratia* iteration, pivoting, and minimum viable products built early to gain customer feedback. Hence, prototyping and early customer inclusion seem to be great choices for larger firms as well, and the concept of working with hypotheses is something firms should reflect on, as it can make the FEI less fuzzy. Secondly, all three processes are based on having openness to both small and drastic changes throughout the whole process, and to harness and learn from them through customer feedback. From the customer development section, it seems like a business model canvas can be suitable to work towards in firms' FEI screening as well, as it is suitable for products, processes and services. It also emphasises the importance of regarding relevant stakeholders and key partners throughout the process, which is merely briefly mentioned within the FEI literature. Hence, one can learn to regard who the key partners and suppliers are, and what key resources that are required from them. It can aid in companies reflecting upon internal and external stakeholders for each project, which is seldom emphasised in the FEI literature. Further, iteration with focus on customer needs can provide *new* visions and further opportunities to pursue.

2.3.3 Criteria

Entrepreneurs external to firms are oftentimes evaluated by Venture Capital, VC, firms that invest in the new business venture. Hence, the VC firms' criteria become the entrepreneurs' criteria, whereby it is of interest to complement the FEI literature with screening criteria from VC firms. VCs look at the entrepreneurs' and venture management teams' characteristics, the characteristics and risks of the product and the market, financial considerations, the venture management team (Chotigeat *et al.,* (1997; Hengquin *et al.,* 2010), and the venture's exit risk (Hengquin *et al.,* 2010). According to the writers of this report, it is of importance to highlight that the characteristics of the entrepreneurs and the team are seen to be important enough to be included in the overall evaluation of the business itself. This is not encountered in any of the FEI literature. One can learn that VC firms regard *exempli gratia* the entrepreneur's ability to evaluate and react to risk, motivation, market competence, leadership skills, reputation, social skills, and previous experiences. Further, the venture management team is evaluated on their technical, managerial, financial, and marketing skills, as well as whether they are balanced as a group or not (Chotigeat *et al.,* 1997; Hengquing *et al.,* 2010).

As already mentioned, the customer development process suggests that the business model should be iterated with incremental delivery of products and services (Ries, 2011; Blank and Dorf, 2012; Sull, 2004). Because of this, this writers of this report advocate that the boxes in the business model canvas acts as the basis for finding a business model, whereby the nine boxes can be regarded as a set of criteria; value propositions, customer segments, channels, customer relationships, revenue streams, key activities, key resources, key partners and cost structure. Entrepreneurs who follow the customer development process will prioritise finding a value proposition that matches a certain customer segment (Blank and Dorf, 2012). This is done through experimenting and asking questions such as: What value do we deliver to our customers? Which customer needs are we satisfying? For

whom are we creating value? Who are our most important customers? (Blank and Dorf, 2012). So the two most important aspects to cover are the value proposition and the customer segment, thereby pointing to the importance of finding a true market need. Moreover, revenue streams are another important aspect to cover, followed by experimenting and asking questions regarding the rest of the six boxes (Blank and Dorf, 2012).

Reflections on theory

There is a much stronger emphasis on the team's and entrepreneurs' characteristics in criteria for evaluation of entrepreneurs than it is within FEI. This as they need be able to take the ship ashore and provide a successful exit for their owners, in a very uncertain environment. However, this is also a similar setting to teams evaluating and developing ideas for radical innovations in large firms. Therefore, it is an important takeaway that the FEI literature has not emphasised enough in the evaluation process. Further, the emphasis here lies in coupling the customer value proposition and the focus on market need, together with revenue streams, in the very beginning of the venture. However, the business model canvas also shows the importance of asking open questions in the beginning of new business developments, rather than specific yes/no questions, and to map all relevant stakeholders.

2.3.4 Stakeholders

This chapter presents literature discussing stakeholders related to the evaluation process of potential innovation ideas in the entrepreneur literature.

The entrepreneur

Existing literature addresses different characteristics of an entrepreneur where different authors outline, to some extent, similar characteristics. Both Veeraraghavan (2009) and Ardichveli *et al.* (2003) agree on that entrepreneurs have characteristics such as a special alertness, which means that they have the capability to exploit unnoticed opportunities. Ardichveli *et al.* (2003) describe entrepreneurial alertness to be the tendency or ability to react to external behaviour, such as market and user problems. Furthermore Veeraraghavan (2009) and Ardichveli *et al.* (2003) agree on the characteristic of having knowledge that is not available to everyone else, whereby the knowledge can help the entrepreneur to discover creative solutions that others would not. Each person's prior knowledge will affect which opportunities they recognise and thereafter want to realise. Different individuals will *exempli gratia* see varying opportunities and applications with the same underemployed resource. And, some who are extremely sensitive to identifying problems or possibilities might not be good for generating solutions to them (Ardichveli *et al.,* 2003). Veeraraghavan (2009) outlines further characteristics of an entrepreneur, describing them as the ability to foresight to assume uncertainty, the ability to react to profit opportunities, and the ability to bear with uncertainty. Veeraraghavan (2009) further describes motivation and a higher need for achievements to be important characteristics. Additionally, Ardichveli *et al.* (2003) highlight the importance of entrepreneurs to be optimistic, creative, and to have a social network, since they can turn to the network to gain information or to start discussions to gain insights.

Sull (2004) highlights the importance of the level of knowledge when it comes to the first steps of screening an opportunity. Level of knowledge here refers to knowledge about *exempli gratia* the industry, which will give the screener the right to have an opinion regarding if the opportunity is good or not. Sull (2004) further argues that the screeners need to have an understanding for uncertainty, which requires a deep understanding of customers as well as regulatory, competitive and technical factors. People, who have not been in a region or an industry for long, often do not have the in-depth knowledge required to be able to evaluate an opportunity. They often do not know which questions to ask or how they should be answered (Sull, 2004).

Management

For companies to facilitate creation and recognition of opportunities, it is important that the employee's skills in identifying, framing, positioning and selling their ideas to others, in particular senior managers, are developed. They need to be able to communicate the opportunity, identify risks and costs, and prove that they are related to existing business. Further, the employees must be educated in recognising opportunities, trends and seemingly unrelated matters (Zahra, 2008).

Reflections on theory

Some additional knowledge can be gained about personality traits that are preferable for entrepreneurial and innovative employees. Entrepreneurs have a special alertness to exploit unnoticed opportunities, to react to external behaviours, and have specific knowledge not available to everyone else helping them discover opportunities. They are further able to bear uncertainty, react quickly to new opportunities, have a high need for achievement, and are optimistic, creative and social. Different entrepreneurs see different applications for the same underemployed resources. As prior knowledge and experience will affect how opportunities are perceived, it highlights the importance of teams with varying knowledge and the right mind-set to be included in large firms when radical ideas are evaluated. Management needs to see to that internal entrepreneurs' skills in framing, positioning and selling their ideas to others, especially senior managers, are developed.

2.4 Conclusion

Radical innovation will in this study be regarded to be a commercialised idea, process or practise that the adoption unit(s) perceives as new, and perceived as new by the firm.

2.4.1 Structure

The FEI includes generation, evaluation, conceptualisation and selection of innovative ideas, and focuses on information collection, lowering uncertainty, and building more detailed concepts of ideas, ending in the yes/no decision of whether to allocate more resources to it in an NPD project. The FEI includes high uncertainty, increasing with ideas' newness level, and should be managed differently than NPD. Firms experiment with having the FEI outside their set processes for new-to-the-firm and discontinuous innovations. Idea screening is part of the FEI, and represents an iterative and continuous culling evaluation process, that changes, develops and redefines ideas. Figure 2-9

below shows the process. The figure presents the screening process of potential radical ideas based on the writers of this report's own analysis, compilation and categorisation of reviewed literature discussing the process' structure. As this research focuses on radical innovations, phase 2 is an iterative and explorative phase with an undefined number of method combinations. The process needs to be adaptable to the company and the innovative ideas' newness level, and includes a tension between control and flexibility. Formalisation of the screening process is positive, but the need for flexibility and iteration increases with the newness level of the idea, especially with high technology uncertainty. Many discussions are coloured by the separation of market and technology driven ideas, apart from their newness level. It should be noted that the FEI screening literature takes the standpoint of product development, and some process development. Hence, there is a risk for it not to be perfectly aligned for services development, highlighting a theoretical gap.

The screening process structure developed by the authors based on existing literature

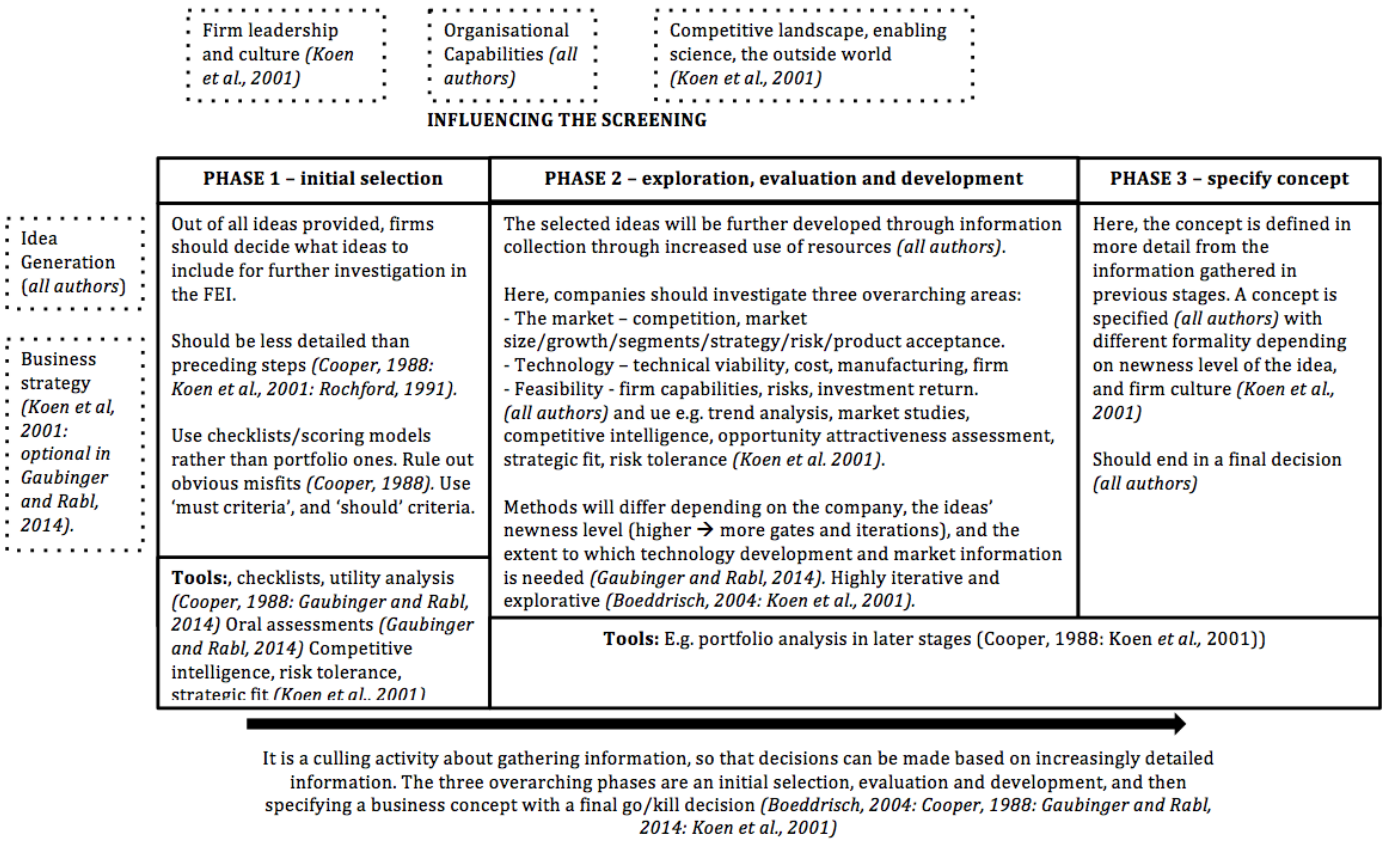


Figure 2-9. The screening process for radical innovations, deducted from FEI literature – own design.

2.4.2 Methods

Depending on the number of screening stages, one or several screening methods may be used by the firm. Initially, qualitative yes/no methods can be used, followed by more detailed and quantitative methods later on. Successful firms combine methods covering the areas processes; methods and tools to experiment and measure; and ensuring required individuals' inclusion. A list of tools and methods used by firms mentioned in the reviewed literature has been compiled by the authors of this report, and is presented in Appendix III.

2.4.3 Criteria

The criteria used should follow a culling structure, with harsher criteria at the end of the process. Different criteria are associated with varying strategic opportunities, whereby they need be holistic and adapted to the specific firm. Companies should apply criteria within the areas technology/feasibility, market/customers, strategy/objectives, project specifics, and resources, and state if originality and radicalness is of interest. Criteria are helpful regardless of innovation newness level, where the difference lies rather in time and effort needed to gather information required and the suitable detail level, and can be weighted through *exempli gratia* must-haves and or balanced scorecards.

2.4.4 Stakeholders

The screening team leaders need be able to lobby for resources, share a team's vision, lead, and have organisational authority. To nurture radical innovations, the team should preferably include people of different opinions and knowledge, should be considered to have cross-functional knowledge, and include team members that personally commit to the goal. The individuals need tolerate high risk, be creative and open to the irrational process. For radical innovations, also managers need to allow for a certain degree of flexibility and accept uncertainty. Higher management is seen to be involved in the screening process of successful, innovative firms, but not throughout the process. Rather, concepts are presented to senior managers so that decisions can be made through authority, and with knowledge and experience. Senior managers are *exempli gratia* linked through continuously being sponsors to projects, and giving teams support and advice. When screening, it is important that managers look at the long-term strategic value, and managers need to communicate clearly the organisation's expectations on a strategic level. Further, they need to allocate a budget allowing for iteration, prototyping and concept development. Managers need to show interest in employees' ideas and innovation work, where *exempli gratia* task feedback and being part of some decisions have shown to heighten the innovation team's goal commitment. It is however not clear exact how and to what extent higher management is needed what knowledge is required from evaluator(s), if it is different for each evaluation time, whether the one(s) generating the ideas should also develop and choose them, or whether the same team should evaluate all the ideas. It is also not clear how ideas should be stored and learned from in later stages of the firm's life. Further, as it is emphasised that management is needed to bring decision power and action to the FEI, it is interesting to question whether management support is needed if the innovation team should be empowered.

2.4.5 Contributions from entrepreneurship literature

The literature review has shown that the field of entrepreneurship provides insightful knowledge when combined with FEI literature. Similarly to FEI, the entrepreneurial evaluation process was explained as cyclical and iterative, including several evaluation stages. Further, opportunity discovery and creation was explained to build a virtuous circle, where one has to understand that generation and screening of ideas cannot always be distinct processes, but continuously inform each other. Entrepreneurial methods that have been introduced are *inter alia* effectuation, where the insightful part of this is maybe not the detailed way of working with effectuation, but rather the mind set, where customers wants or needs are ambiguous and entrepreneurs need to focus on the underlying problem. The discussion allowing firms to create the future rather than to try and

achieve a specific scenario is however here seen to be applicable to highly radical ideas, that are not only new to the firm. The three remaining entrepreneurial methods were presented as iterative processes with a focal point of finding the right customer problem as a basis for building a business model, through *exempli gratia* iteration, pivoting, and minimum viable products early to gain customer feedback. Testing of hypotheses, prototyping and early customer inclusions seem to be great choices for larger firms as well, as it can make the FEI less fuzzy. All three methods are based on having openness to both small and drastic changes throughout the whole process, and to harness and learn from them through customer feedback. Furthermore, it seems like the business model canvas can be suitable to use in the screening process, since all nine components are important to look into throughout a screening process. Contrary to FEI literature, the business model canvas emphasises the importance of regarding relevant stakeholders and key partners throughout the process, as well as asking open-ended questions rather than yes/no questions. Moreover, entrepreneurial literature, compared to FEI literature, put much stronger emphasis on the entrepreneur's and the team's characteristics in the criteria for evaluation. It has been shown that this is an important takeaway that FEI literature has not emphasised enough in the evaluation process.

Another area that was found to provide additional knowledge to FEI literature regards entrepreneurial personality traits. Entrepreneurs have a special alertness to exploit unnoticed opportunities, to react to external behaviours, and have specific knowledge not available to everyone else helping them discover opportunities. They are further able to bear uncertainty, react quickly to new opportunities, have a high need for achievement, and are optimistic, creative and social. As prior knowledge and experience affect how opportunities are perceived, it highlights the importance of teams with varying knowledge and the right mind-set to be included in large firms when radical ideas are evaluated. Management's role is to provide education regarding skills in framing, positioning and selling of ideas

3 Methodology

The following chapter aims to present the methodology used to research how Volvo can structure the process for screening radical ideas in the FEI. It is important to discuss, as the study's design influences the quality of the research's results. Hence, the chapter will present the chosen research strategy and process, design, data collection, data analysis, sampling and research quality, and the reasoning behind the choices. It is ended with a discussion of the research's quality.

3.1 Research strategy

Choosing the research strategy sets a general orientation of the business research, where the study can be either qualitative or quantitative (Bryman and Bell, 2007). The difference between the two is that a quantitative research strategy refers to either data collection techniques, such as questionnaires, or data analysis procedures that generate or use numerical data. Contrary, a qualitative research strategy refers to either data collection techniques, such as interviews, or data analysis procedures that generate or uses non-numerical data (Saunders *et al.*, 2012). Moreover, a qualitative strategy is of specific relevance to studies of social relations (Flick, 2009). This study took a qualitative research approach, since the outcome of the study needed no hard data analysis, but rather aimed to create an understanding of the subject. Furthermore, the qualitative research strategy was found suitable since the study aimed to generate new knowledge, since the field of idea screening for potential radical innovation in large firms has not received enough attention in existing literature as mentioned in the previous background. Additionally, the qualitative strategy was found appropriate since the study aimed at finding an understanding of social relations, meaning that the data collection needed be focused on individuals and groups and their own decision-making.

Due to the study's exploratory nature and qualitative strategy, it entailed using an inductive approach, since the purpose was to use the data collection to explore the area and identify themes and patterns resulting in a conceptual framework. Furthermore, the absence of numerical data and testing of hypotheses further motivated the use of an inductive approach, since the appropriate approach then would have been the deductive approach (Saunders *et al.*, 2012). One also needs to be aware of that the inductive approach, due to its specific nature, sometimes develops empirical generalisations rather than new theory per se (Bryman and Bell, 2007). Since the study took an inductive approach with a qualitative research strategy it determines the process of the research, whereupon the coming section will present how the research process was organised.

3.2 Research process

As mentioned, the research strategy outlined the process of the study, whereon the research process suggested by Saunders *et al.* (2012), see figure 3-1, was found appropriate. However it is important to notice that even though it follows a linear manner, it is an iterative process where phases often overlap.

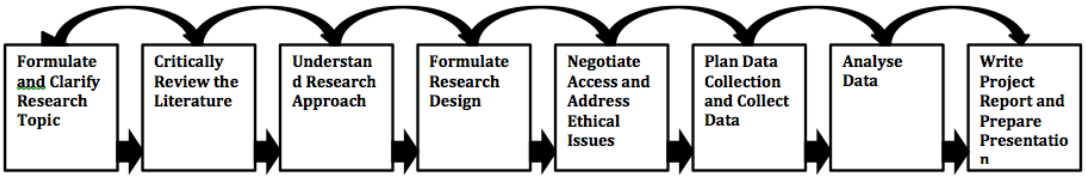


Figure 3-1. The research process by Saunders *et al.* (2012). Own design.

Since the study followed an inductive approach, the research process started with an exploratory phase. Naturally, the study was then followed with a planning phase, where the initial purpose and research questions were formulated. This was done with initial meetings at both Volvo as well as with the supervisors at Chalmers University of Technology. The planning was concretised through submitting a research proposal, including a theoretical background, initial purpose and research question, method and a time plan. The planning and the research phase is represented by step *1. Initial Research.* The formulation of the research purpose and questions at this stage is represented by step *2, Formulation of Research purpose and question* in figure 3-3 below. In the early stages of the study, one of the supervisors left Chalmers University of Technology and could therefor not continue as a supervisor. Since another supervisor was involved from the beginning and could continue the process alone, there was no need to start over or to consider the front-end work of the study useless. Hence, the study continued without further ado.

Purpose 1.0
How should Volvo Group screen ideas for radical innovations?

Research questions 1.0
RQ1) What is Radical Innovation?
RQ2) What phases are included in the front-end phase of Radical Innovation?
RQ3) What is included in the process of screening radical ideas?
RQ4) How is Volvo Group currently working with front-end idea screening for radical innovation?
RQ5) How are other companies successfully working with front-end idea screening for radical innovations?
RQ6) Based on the answers to the above questions, what are sensible recommendations to provide Volvo with regarding how to screen ideas of radical innovations in the front-end phase?
RQ7) What implications or learning outcomes can be envisioned, with respect to the academic literature on the subject?

Early meetings with key persons at Volvo, see step *3. Meetings at Volvo* in figure 3-3 below, revealed their new process-oriented workflow and their need for a standardised process for working with idea screening. Through these meetings and discussions with the supervisor at Volvo, the authors gained an understanding of that there was an interest in finding some sort of best practise. Although there was an interest in finding best practise, the authors of this study recognised the need to combine the understanding of how other large firms have operationalized their processes for idea screening with theoretical insights and insights from experts in the area. This data would later on in the research process be analysed to fit Volvo's context and thereby act as a foundation for the proposed process for how they should work with idea screening.

Consequently, the purpose and the research questions were further revised, see step *4. Revision of research purpose and questions* in figure 3-3. The initial research questions were good as a start and worked as a good basis for the initiation of the study, but moving forward from there, the authors felt a need to revise them. Changing the research questions would help the authors answer the research purpose, since the focus was directed from gaining an initial understanding of the topic, towards being more focused on the screening of ideas. Thus, it became evident that an explorative literature study needed be executed as well as a thorough empirical study, including a comparative cross-sectional case study (multiple-case study) of companies working with idea screening and interviews with experts in the field, see step *5. Research design* in figure 3-3.

Purpose 2.0
How can large companies screen ideas for innovations?

Research questions 2.0
RQ1) What is known about idea evaluation within frond end of innovation, new product development, the field of venture capital and entrepreneurial theory and practise?
RQ2) What is currently considered best practise regarding screening and evaluating innovative ideas in the early phases?
RQ3) How can vision and strategic objectives be taken into account in the screening process?

The explorative literature study, step *6. Literature study phase 1 in figure 3-3,* enhanced and deepened the understanding of the research topic and helped the researchers to formulate a research purpose and research questions. It showed which areas that were important as well as identified gaps that needed to be considered and addressed. Critically reviewed, the revealed bodies of literature that needed be included according to the authors were theory regarding innovation, FEI, entrepreneurship, strategy and the field of venture capital. According to the authors, literature regarding FEI seemed to be able to provide an understanding of the more traditional knowledge of screening. Theory regarding entrepreneurship and venture capitalism seemed appropriate since the authors here believed that these two areas could complement the FEI theory with insights and inputs. Even though entrepreneurial firms are rather different to large firms, the authors believed that including the fields of entrepreneurship and venture capital would be beneficial even for large firms. FEI literature, *exempli gratia* Bessant *et al.* (2010) and Ardichvili *et al.,* (2003) have also emphasised the possibility to learn from the field of entrepreneurship. The gained knowledge from the literature study helped form the basis for the data collection and provided an understanding of what to ask and what to look for in the empirical study. It also provided a foundation for identifying key persons to interview and what type of knowledge and experience they needed to possess in order to be able to answer to give descriptive answers to the questions asked. Throughout this process, the research questions were slightly revised, although not completely changed.

Purpose 3.0 – final
The purpose of this study is to understand how a large company, such as Volvo, should organise their screening process for potential radical innovation.

Research questions 3.0 - final

RQ) When critically comparing and combining findings from SRQ1 and SRQ2 with reviewed literature, how can the process for idea screening of potential radical innovation in the FEI be organised for the Volvo Group?

SRQ1) What complementary knowledge can be gained from experts within the fields of venture capital, Entrepreneurship, and FEI regarding idea screening for potential radical innovations?
SRQ2) What does best practise look like today in large firms regarding idea screening for potential radical innovation in the FEI?

Following the first phase of the literature study was a phase of an exploratory secondary research, step *7. Secondary research (identify companies)* in figure 3-3. The purpose of this phase was to find suitable companies to include in the multiple-case study, as well as to find suitable experts in the addressed theoretical areas.

The aim of the analysis in step *8. Analysis* was to identify what firms to contact as part of the multiple-case study in step *9b*. This was analysed in several steps, which is explained in more detail under chapter 3.5. The information gathered from the secondary data and reviewed literature were compared and contrasted. A list was compiled of firms that were mentioned explicitly for active and successful innovation work, from sources recent enough, to which the researchers had contact details to the relevant innovation responsible employees were selected. Hence, firms that were practising best practise could be contacted.

The second phase of the literature study, *9a. Literature study phase 2,* aimed to further investigate and describe the identified and addressed bodies of literature. This was made in parallel with the multiple-case study, *9b. Multiple-case study* and the expert interviews within the areas of FEI, entrepreneurship and VC, *9c. Expert interviews*. Figure 3-2. shows which research question(s) each of these studies aims to answer.

The analysis in step *10* in figure 3-3 was done in three steps. First, coding was used to identify themes in expert interviews, which were then contrasted and compared with the literature findings to address SRQ1. Secondly, coding was used to identify themes in the case studies, and they were compared and contrasted amongst each other to address SRQ2. Thirdly, all findings were compared and contrasted to serve as a basis to answering RQ, through providing managerial implications for large firms.

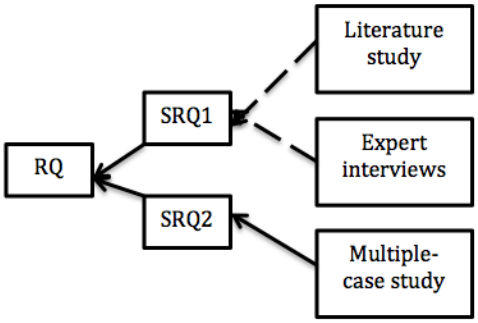


Figure 3-2 – Relationship between studies, RQ and SRQs

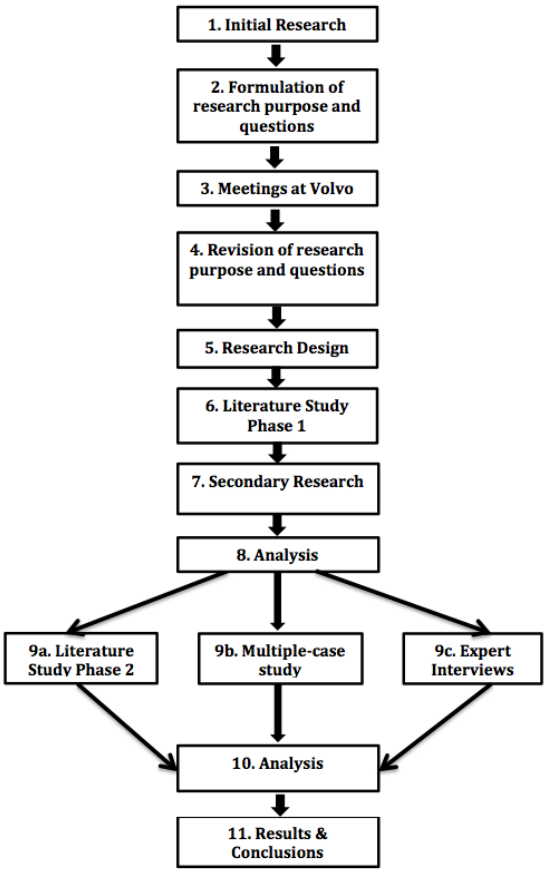


Figure 3-3. The applied research process

3.3 Research design

According to Saunders *et al.* (2012) the research design is the general plan of how you intend to answer the research question, including objectives and sources from which data is planned to be collected. Furthermore, the research design presents how the data collection is supposed to be organised and how to analyse it (Saunders *et al.*, 2012). The different steps in the research process needed different research designs in order to be able to collect data in an appropriate way to be able to answer the defined purpose and research question.

The research design in this study was of exploratory nature, since the study addressed a theme that was initially rather new to the authors. Furthermore, each smaller part of the study were characterised by different research designs. The early phases of the research process were of exploratory nature, so that the authors could gain a deeper understanding of the research topic to be able to formulate research purpose and research questions. The first phase of the literature study was also of exploratory nature as well as the secondary research. Saunders *et al.* (2012) argue that an exploratory research is particularly useful when the aim is to clarify understanding of a problem, which underpinned the use of this design. Furthermore, Saunders *et al.* (2012) argue that exploratory research has the advantage of being flexible and adaptable to change. This was considered to be beneficial in this study since there was no specific roadmap as to how the study should be formulated and designed.

The second phase of the literature study was of a descriptive nature to gain a deeper understanding of the different bodies of literature that were identified in phase one of the literature study. This followed the exploratory phase of the literature study naturally. Through this, the authors gained a

deep understanding of existing previous research in the chosen areas innovation, FEI, entrepreneurship, strategy and venture capitalism. This helped form the literary foundation that has had an important part in answering the research question.

The empirical study was divided into three parts, where one part regarded looking into how other companies work with idea screening today. Hence, one part of the empirical study had a descriptive comparative cross-sectional case study design, also referred to as a multiple-case study. Although, the term multiple-case study is used from here on, there is a need to explain the terms descriptive comparative cross-sectional case study so that the external reader can get a true picture of how the study was designed. A comparative design is described as involving identical or similar methods on two or more cases that contrast each other (Flick, 2009; Bryman and Bell, 2007). A cross-sectional case study is described as the study of a particular phenomenon at a particular time on two or more cases (Saunders *et al.*, 2012). This was regarded as the necessary design to be able to answer the research questions. It is further important to understand that this design makes it possible to compare the different cases and thereafter provide a picture of what best practise is regarding idea screening. However, it should be noted that drawbacks with this type of design is related to that the companies that have been interviewed are companies from different industries with different empirical contexts and different conditions. This has somewhat created incoherence in the study, but since Bessant *et al.* (2010) have used the same design, the design in this study is still considered to be valid. Valid in the sense that this study was not aiming to be generalised, but rather get input from many different sources of information, since knowledge in this subject is rather dispersed. Additionally, since the aim of the study is to provide a holistic perspective on the subject, this incoherence is not considered to derail the analysis, but will of course be taken into consideration. Another disadvantage with this type of design is that it becomes somewhat dependent on which companies and which people in the company are chosen. The authors tried to mitigate this through the execution of the expert interviews, in order to triangulate and get a further broadened understanding of possible gaps that occurred in the multiple-case study. These expert interviews were conducted in parallel with the multiple-case study to help answer SRQ1, and included experts in the fields of FEI, entrepreneurship and the field of venture capital, VC. Not only was the purpose of the interviews to triangulate the multiple-case study, they also aimed at providing knowledge and insights as to what the experts believed is important to take into consideration in idea screening and thereby complement both the multiple-case study and the literature. Due to sometimes out-dated articles, the expert interviews were further deemed appropriate to provide the researchers with up to date knowledge.

3.4 Data collection

To be able to answer the purpose of this study a large amount of data needed be collected. The qualitative strategy called for data collection based on unstructured and semi-structured interviews, both within Volvo as well as in the multiple-case study and the expert interviews. This allowed the researchers to ask general questions as well as opened up the possibility for the interviewee to elaborate on subjects that otherwise might be excluded.

The unstructured interviews were used in the exploratory initial research phase within Volvo, to gain understanding of Volvo's context and the research topic. According to Saunders *et al.* (2012) the unstructured interviews are informal and used to explore in depth a general area that is of interest. Furthermore, Saunders *et al.* (2012) argue that there is no predetermined list of which questions to ask, although the interviewer needs to have a clear idea about the area that is going to be explored. The unstructured interviews were made with six different key persons within the company and made it possible for the interviewees to talk freely about Volvo as a company and their own experiences with the topic and help the interviewers to deepen their knowledge in the field. This exploratory phase required flexibility and an openness to interesting issues that emerged during the interviews, since the researchers knew little about the topic, the empirical context and the purpose of the study.

Semi-structured interviews were used in the multiple-case study and in the expert interviews, since this allowed asking general questions. When conducting semi-structured interviews, the interviewer has a predetermined guide of questions or areas to discuss to some extent, but can however diverge from it if interesting issues arise during the interview (Bryman and Bell, 2007; Saunders *et al.*, 2012). Semi-structured interviews were considered necessary since the initial research phase had revealed subjects and topics that needed further investigation, but nevertheless still some openness and flexibility. The different companies had different empirical contexts and therefore naturally needed the flexibility. The same was true for the interviews with the expert interviews from the areas of FEI, entrepreneurship and VC. These semi-structured interviews enabled the researchers to gain an understanding of what best practise might look like and deepened the knowledge about idea screening in large firms. The multiple-case study also allowed the researchers to identify gaps between existing literature and what is being done in reality.

All experts but one have extensive academic and practical experience within their field of expertise. This allowed the interviewers to gain a deeper understanding of what the different areas entailed regarding idea screening from an expert point of view. Neither the expert interviews nor the multiple-case study would have benefitted from using structured interviews, since this would have controlled the information gathered in a way not allowing for contextual differences. Therefore, semi-structured interviews were considered as the appropriate method for collecting the data.

The secondary research included using the Internet to gather information regarding which companies to include in the multiple-case study. Here, data was collected from Innovationmanagement.se (2013), Boston Consulting Group (2013), Fast Company & Inc. (2014), Forbes (2014), and input from old lectures at Chalmers. These sources of information were partly selected on the basis of the authors' previous knowledge, foremost regarding the lectures at Chalmers. Furthermore, Boston Consulting Group (2013), Fast Company & Inc. (2014) and Forbes (2014) were selected with the prerequisite that they were from trusted, well known sources and that they complemented each other in the sense that they had different methods behind their reports.

3.5 Sampling

When a study includes research questions where it is impracticable to collect data from an entire population, one needs to select a sample. This is equally important whether the planned data collection will have a qualitative or a quantitative approach (Saunders *et al.*, 2012). This study included non-probability sampling, where the initial research phase included already set-up interviews within Volvo. These unstructured interviews were in other words not set-up by the researchers and were as already mentioned conducted to gain an initial understanding of the context. Hence, they did not act as a basis for the research but were essential for the researchers to partly formulate the purpose and the research questions for the study. These interviews were set-up by the supervisor at Volvo, since he was the person in the lead from Volvo's side in this research. The internal contacts that the supervisor has, made it possible to meet people from Volvo with knowledge about strategy, planning, screening and corporate values. Although the interviews were not set-up by the researchers themselves, the researchers made sure to check the relevance of the interviewees' knowledge as well as their title and role in the firm, bearing in mind that the supervisor might be biased in his choices.

The used sampling approach in the multiple-case study and in the expert interviews was inspired by purposive sampling and convenience sampling. Purposive sampling refers to when one has to use own judgement to select cases to be able to answer the research questions. This type of sampling is often used when conducting case studies and informative cases are needed. Convenience sampling refers to when cases are selected based on their ease of access (Saunders *et al.,* 2012). What this meant in this study was that the sampling started as a purposive sampling, where the researchers through the above mentioned secondary data and first phase of the literature review, identified companies that would be beneficial to interview. This was based on that firms were regarded to be continuously innovative. Convenience sampling then followed the purposive sampling, which was based on the companies' accessibility, both from a country perspective but also based on a contact network provided by the supervisor at Volvo. The companies that were then interviewed were Swisslog, Hype, Alfa Laval, AstraZeneca, Company X and Company Y that will be left anonymous. In each of these companies, the researchers chose to interview one person, which in many cases was an innovations manager. The reason behind this was that most companies usually only have one person responsible for the overall process. Therefore, these persons could provide answers to the detailed extent that was sought after by the researchers. This reasoning was based on that there was a time frame combined with that the study would benefit from having a higher number of different companies involved, rather than fewer companies but with more people interviewed in each company. Although there was a risk for a biased outcome from the empirical study, the researchers saw no reason to interview several people at each company since other people than the ones interviewed would not be able to provide an accurate picture of their management perspective. Similarly to this study, Martinsou and Poskela (2009) conducted a study that was based on the responses of single informants at each company. The authors made a conscious choice and put special emphasis on selecting the knowledgeable informant in the subject matter. Based on this, the researchers of this study believed that having a single respondent in each company would provide a good basis for gathering information regarding best practises. The full list of the

respondents from the multiple-case study can be seen in table 3-1 below, and more detailed information regarding the interviews are available in Appendix I.

Table 3-1 Multiple case-study interviews

Company	#Employees	Industry	Interviewee's position
Swisslog	2 200	Healthcare solutions and Warehouse & Distribution Solutions	Innovation Manager
AstraZeneca	50 000	Pharmaceutical	Project Director
Company Y	44 000	Consumer goods	Director Innovation and knowledge Management
Company X	75 000	Networking equipment	Innovation Program Manager
Hype Softwaretechnik GmbH		Computer Software	Collaboration and Innovation Consultant
Alfa Laval	12 000	Heat transfer, separation and fluid handling technologies	Concept Manager/Innovation Management processes

Table 3-2. Expert interviews

Interviewee	Background	Area of expertise
Bessant, PhD	Professor of Innovation and Entrepreneurship. Holds the Chair in Innovation and Entrepreneurship at Exeter University. Fellowship at Advanced Institute for Management Research and the British Academy of Management. Author of 20 books and many articles.	Front end of Innovation and Entrepreneurship
Expert A, Full Professor and PhD	Full Professor in one of the top ranked Technology Universities in Sweden. Experience from innovation incubation as well as start-ups and large firms. Board member in various firms.	Entrepreneurship, venture capital, and innovation
Hedvall	Venture Capital and Business Development Professional. Business Advisor at Encubator AB. Board chairman, director and co-founder of several technology firms. Managed several spin-outs and joint ventures with global corporations in e.g.pharmaceutical- and paper & pulp industry. Experience from advising foreign public corporations and governmental agencies on industrial innovation.	Entrepreneurship, VC and Incubation
Gartner Inc.	Consultancy firm	Firm practises
Elerud-Tryde, LicEng and Doctoral Student	LicEng., Doctoral Student connected to Center for Business Innovation at Chalmers University of Technology. Investigates the early phases of innovation work; idea generation and assessment.	Idea screening of innovation jams
Wockatz, Senior Technologist	Senior position in the UK's Technology and Innovation Centre for Intelligent Mobility. Experiences with strategic, intelligence and innovation work. Jury member Venture Cup.	Strategic, intelligence and innovation work
Brasta	Vice President Communication and Innovation, Volvo Group Brand & Identity Management, Corporate Communications, Creative Communications, Marketing, Change management, Project management	Marketing, communication and innovation management

The sampling approach for the expert interviews followed the same approach as the one for the multiple-case study, i.e. purposive sampling and convenience sampling. Here, the interviewed experts were Wockatz, Elerud-Tryde, Hedvall, Bessant, a representative from Gartner, Inc. and Expert A, who will be left anonymous. Furthermore, Brasta was interviewed in order to gain an understanding of senior management perspective in a large firm. The full list of the respondents from the expert interviews, including the interview with Brasta, can be seen in table 3-2 above, and more detailed information regarding the interviews are available in Appendix I.

3.6 Data analysis

Data analysis has primarily been conducted in two phases: in step 8 and step 10 in figure 3-3 above. The aim of the analysis in step 8 was to identify what firms to contact as part of the multiple case study in step 9b. This was analysed in several steps, which is explained in more detail under chapter 3.5 above, and included sources from secondary data and literature within FEI. The different sources of information were compared and contrasted. A list of firms was produced based on that the firms were mentioned explicitly for their active and successful innovation work, from sources recent enough, and that the researchers had contact details to the relevant innovation responsible employees. Hence, firms that were performing best practise could be contacted.

The second analysis was conducted after all data had been collected, see step 10 in figure 3-3, and aimed to build the foundation for the report's discussion and recommendations. Step 10 was divided into three steps, and done through coding, as it aims to dissect documents of empirical findings into meaningful themes or entities (Saunders et al., 2012). First, the written documents including all raw findings from each expert interview were read through several times. In each step, themes and new sub-themes were identified, and chunks of text were divided into these themes. The information in these themes was then related to the overall areas of "Structure" "Methods" "Criteria" and "Stakeholders" used in the literature review. However, there was also an "Others" section where themes that were not relatable to those of the literature review were kept, so to not manipulate data. Following this, the findings from the experts were contrasted to those of the literature review. This was done to address SRQ1. In the second step, the raw empirics from the case study interviews were coded in the same way as the expert interviews. Then, similarities and differences were analysed between all firms within the identified themes, to address SRQ2. In the third step, the results from step two were compared and contrasted with those of step one, to serve as a foundation to answering RQ. This resulted in managerial implications for large firms over all. The reasoning regarding why specific findings were chosen to serve as managerial implications is presented in chapters 5 and 6.

3.7 Quality of research design

The trustworthiness of a chosen methodology is most often divided into issues of reliability and validity, where the latter is divided up into internal and external validity issues (Saunders et al., 2012). This has been dealt with throughout the text above, but some important areas will be highlighted here. Internal validity will however not be discussed, as it applies to causal and explanatory research, rather than exploratory or purely descriptive ones (Saunders et al., 2012).

3.7.1 Primary data

Reliability

The concept of reliability refers to the measure consistency of the work, i.e. whether the data collection techniques and analytic procedures would produce consistent findings if they were replicated (Bryman and Bell, 2007; Saunders *et al.,* 2012). For semi- and unstructured interviews, there is a question of reliability in the standardisation possibilities due to the nature of the techniques (Bryman and Bell, 2007). However, as Saunders *et al.,* (2012) note, this type of research is not intended to be perfectly repeatable, since it rather represents reality in one point in time, which is indeed true for this research. Yet, to address the issue, the research design and reasons for actions were always thought through prior to actions taken, which have been documented so that others can follow the reasoning. Further, all interview guides have been saved and included in the report, the dates, time and place of all interviews have been documented, and the choices for the research strategy has been clearly outlined in the report, as advocated by (Marshall and Rossman, 2006). Hence, other researchers can understand the process and easier reanalyse the collected data.

Four areas can represent other threats to reliability, which induce bias: participant error, participant bias, researcher error, and researcher bias (Saunders *et al.,* 2012). To overcome these, the interviewers took several actions; they studied interview technique prior to conducting them; studied the literature so to ask the right types of questions and provide a knowledgeable impression; the purpose and design of the research were provided to the interviewees in beforehand; the interview guides were used without leading questions; interviews were conducted in an uninterrupted, closed business environment for interviewees to dare provide truthful answers, the interviewees were ensured to get to see the end-results of the study to establish trust, and; the interviewers always dressed properly for business meetings. All these actions are proposed by Saunders *et al.* (2012) to increase reliability of qualitative research.

Validity

Even though internal validity discussions are not applicable to this research, it is still of interest to discuss whether the correct measures of the concepts have been used, so that relevant data is analysed. This has been addressed through triangulation of data, as proposed by Marshall and Rossman (2006). The expert interviews described above were conducted within the two main bodies of literature studied for idea screening – entrepreneurship and FEI – so that literature findings were complemented. All interviews were also ended by interviewees being asked whether there was something not asked, that needed to be, to understand the procedures correctly. This to ensure that no vital information for understanding the situation would be unnoticed. Additionally, the information regarding dates and places for all interviews are included in Appendix I to ensure validity, and information of the research process and design has been explicitly outlined.

External validity, then, regards the findings generalizability to other relevant settings or groups (Saunders *et al.,* 2012). To increase generalizability, companies within several industries were interviewed for best practises, so that understanding of industry and company flexibility in the proposed process for Volvo would be understood. This was further added to by the expert

interviews. This is important as *exempli gratia* Bryman and Bell (2007) note that a single case study very rarely can provide results that can be applied to other contexts than its own. Hence, even though the recommended approach is directed towards large firms like Volvo, the general findings of the screening process for innovative ideas in the front-end phase of innovation gains increased generalizability. However, it need still be noted that the findings will apply to a specific type of firm, i.e. large and industrialised. Further, all cases have been studied in Western Europe, whereby there is a possibility that the findings are culturally dependent.

3.7.2 Secondary data

The validity and reliability of secondary data relates to the methods used to gather it, and from what source it was collected (Saunders *et al.,* 2012). Data gathered from large, well-known survey companies are according to Saunders *et al.* (2012) trustworthy, as the reputation and future of the firms rely on the quality of the data. Hence, the data chosen for choice of companies to interview is regarded as valid and reliable. However, it must be taken into account that secondary data is gathered for research with another purpose than this (Bryman and Bell, 2007). To mitigate this, several reports with different measure of 'company innovativeness' were used in combination to address that issue. Further, the way the data was collected was considered so that the chosen lists of companies complemented each other, as proposed by Saunders *et al.* (2012). These findings were further triangulated with information from innovation blogs and from academic literature to enhance the quality.

4 Empirics

This section will present the findings generated from the expert interviews and case studies. However, it will not present data regarding Volvo, as this is presented in the Introduction chapter, under "Empirical context". Therefore, the reader is referred to that chapter regarding this information. The empirical findings chapter will follow the same structure as chapter 2, and present data in the form of tables. The tables will present the key information received from all interviewees, clustered into themes. The chapter aims to lay the foundation for this report's analysis chapter, which will compare and contrast the here presented findings, and relate them to large companies like Volvo. Hence, the empirical findings chapter aims to lay the foundation to answering SRQ1 and SRQ2 and thereby also RQ.

4.1 Structure

The following tables present the main empirical findings regarding the structure of the screening process. Firstly, there are two tables, 4-1 and 4-2, representing the findings from the experts, followed by two tables, 4-3 and 4-4, representing the findings from the multiple-case study. As already mentioned, the authors identified themes regarding *inter alia* structure of the screening process, where the areas were; *Influencing factors, The Process Design, Funnel Structure* and *The End Result.* Here, the reader can get a chance to briefly gain an insight into for example which experts advocate a stage-gate model and which companies that have that type of set-up, see *The Process Design*. Furthermore, *Funnel Structure* relates to the need for the process to be an iterative culling activity, whilst *The End Result* presents what the different representatives argue is a good outcome from a screening process.

Table 4-1. Empirical Findings – expert interviews. Structure part 1

.

Structure	Influencing Factors	The Process Design	Funnel Structure	The End Result
Anne Elerud-Tryde	- Generation process. -Can be set process to anyone randomly bringing forward ideas. - Different between process for radical and incremental idea screening	- Can be standardised to some extent.	- Ideas are not great in the beginning.	
Christer Brasta				- Short support document. Selling and visionary, as well as hard facts and business case
Gartner	- Different between process for radical and incremental idea screening			

Table 4-2. Empirical Findings – expert interviews. Structure part 2.

Structure	Influencing Factors	The Process Design	Funnel Structure	The End Result
Bessant	- Cannot be one system for everything. - Different between process for radical and incremental idea screening.	- Firms sometimes need the discipline of stage-gate processes. - Stage-gate can be too tough: ideas need to be developed. - For high newness level: run as entrepreneurs.	- Screening is an iterative culling idea with several phases.	- Business Case - Business model canvas is good.
Wockatz	- Influenced by generation process. - Firms need a set process, planned jams, or related project planning for ideas to receive interest. - Depends on local needs.	- Cannot be too detailed nor too flexible. Firms need to find a balance. - Standardise enough for people to understand and for the firm to accept it. - Need to be adaptable.	- Screening is an iterative culling idea with several phases. - Let bad ideas through early on: otherwise you miss the good radical ideas.	- Business Case - Business model canvas is good. - Sometimes a scaled down version. - Look at desirability, feasibility, viability.
Expert A	- Different technologies require different time for development. - Services vs. Products, difference lies in time needed. - Different between process for radical and incremental idea screening.	- Drivers of ideas cannot be hindered by bureaucracy. - Allow for free information and customer access. - Stage-gate process is ridiculous to use if not incremental innovations. Simulate VC process instead. - Consider the burning platform for entrepreneurs.	- Screening is an iterative culling idea with several phases. - Evaluate as the idea develops and progresses. - Ideas are not great in the beginning. - Entrepreneurs build a concept step-by-step.	
Hedvall	- Adapt process to market and application - Differences in time and dialogues needed - Different between process for radical and incremental idea screening	- Consider the burning platform for entrepreneurs. - Culling activity.	- Ideas are not great in the beginning. - Entrepreneurs build a concept step-by-step.	

Table 4-3. Empirical Findings – case studies. Structure part 1.

Structure	Influencing Factors	The Process Design	Funnel Structure	The End Result
Alfa Laval	- Different process for new-to-the firm innovations vs. Ideas for incremental	- Stage-gate process for new-to-the-firm ideas screening process. - Use qualitative rough methods initially. - Uses an A3 to decide if to explore. - Early, focus on showstoppers.	- Follows the essence of phases 1-3 in the screening process presented in conclusions in the Literature Review by this report's authors.	- Often business case. - Adapted to idea type.
AstraZeneca	- Different process for new-to-the firm innovations vs. Ideas for incremental.	- Not a set stage-gate process. - Long-term. Pitch for money. - Continuous inclusion of foresight work and trend analysis.	- Follows the essence of phases 1-3 in the screening process presented in conclusions in the Literature Review by this report's authors. - stages are focused on testing, gathering information, lowering uncertainty, culling ideas, and building a case/concept.	
Swisslog	- Different process for new-to-the firm innovations vs. Ideas for incremental. - Difference between jam generated and continuous submissions.	- Stage-gate process for new-to-the-firm ideas screening process. - Further ideas can be generated throughout the process. - Design driven approach. Explore several applications. - Continuously submitted ideas reviewed every 3 months. - Match continuous ideas to part of business and let them screen. - Find sponsor.	- Follows the essence of phases 1-3 in the screening process presented in conclusions in the Literature Review by this report's authors. - stages are focused on testing, gathering information, lowering uncertainty, culling ideas, and building a case/concept.	- Business case. - Needs to be interesting and convincing.

Table 4-4. Empirical Findings – case studies. Structure part 2.

Structure	Influencing Factors	The Process Design	Funnel Structure	The End Result
Company Y	- Different process for new-to-the firm innovations vs. Ideas for incremental.	- Stage-gate process for new-to-the-firm ideas screening process. - Judges early by a risk/effort/potential matrix. - Early management inclusion. - Close to customer development process.	- Follows the essence of phases 1-3 in the screening process presented in conclusions in the Literature Review by this report's authors. - Stages are focused on testing, gathering information, lowering uncertainty, culling ideas, and building a case/concept. - Focuses on the technology part of the concept in the later stages, and customer needs and application in the first stages	- Business case.
Hype	- Different process for new-to-the firm innovations vs. Ideas for incremental. - Firms have different processes for campaign-based and continuously submitted ideas. Use continuous only if you have campaignt. They are better.	- Difference with campaigns: several additional initial screens are done before ideas enter the development.	- Follows the essence of phases 1-3 in the screening process presented in conclusions in the Literature Review by this report's authors. - Stages are focused on testing, gathering information, lowering uncertainty, culling ideas, and building a case/concept. - Focuses on the technology part of the concept in the later stages, and customer needs and application in the first stages	- Business case.
Company X	- Different process for Campaigns vs. Always on. - Campaigns are better.	Continously submitted: - Match continous ideas to part os business and let them screen. - Find sponsor and iner-firm burning platform early on. - Sell and hand over to business units.	- Follows the essence of phases 1-3 in the screening process presented in conclusions in the Literature Review by this report's authors. - Stages are focused on testing, gathering information, lowering uncertainty, culling ideas, and building a case/concept. - Focuses on the technology part of the concept in the later stages, and customer needs and application in the first stages	- Business case. - Building a story

4.2 Methods

The following tables present the main empirical findings regarding the methods to use in the screening process. Firstly, there are two tables, 4-5 and 4-6, representing the findings from the experts, followed by two tables, 4-7 and 4-8, representing the findings from the multiple-case study. The themes that were identified by the authors regarding possible methods to use throughout the screening process were *Dragon's Den, Portfolio Management, Pitching to Management, Open Innovation and Crowdsourcing, Customer Development and Lean Start-up, Business Model Canvas* and *Hackathon.* In the multiple-case study, the themes *Prototyping* and *Balanced Scorecards* were also identified. The tables provide an understanding of for example which experts and companies advocate using innovation events such as Dragon's Den, and which experts and companies advocate using portfolio management and the purpose behind it. Furthermore, *Customer Development* shows opinions behind why large companies could benefit from using a more entrepreneurial method, whilst *Open Innovation and Crowdsourcing* presents what the benefits could be when using those types of methods.

Table 4-5 Empirical Findings – expert interviews. Methods part 1.

Methods	Dragon's Den	Portfolio Managemen	Pitching to managemen	Open Innovation Crowd	Customer Development Lean Start-Up	Busin ess Mode	Hackathon
Anne Elerud-Tryde		- Current portfolio influences.					
Christer Brasta	Good: - Influences Culture. - Shows Support.	- Desirable. - Can compare ideas.					
Gartner		- Is used by firms	Good.				
John Bessant		- Firms need to have a balanced portfolio - Helps to compare ideas	Good for crazy ideas-	Wisdom of the crowds.	- Radical ideas can be developed enough for evaluation. - Forces thinking of markets, technologies, risks. - Promotes coherency through business model canvas.	Good.	
Philip Wockatz	Good: - Helps simulate VC process.	- Need to also have a portfolio perspective	Good.	Good with OI	- Good: Lets through radical ideas - Helps anchor idea in customer problem. - Helps identify key stakeholders. - Radical ideas can be. developmed enough for evaluation.	Good.	Good. - Promotes VC. - Alike customer developmen. - Champions are provided. - Time limited development.

Table 4-6. Empirical Findings – expert interviews. Methods part 2.

Methods	Dragon's Den	Portfolio Management	Pitching to management	Open Innovation Crowd Sourcing	Customer Development Lean Start-Up	Business Model Canvas	Hackathon
Expert A	Good: - Helps simulate VC process		Good. - Used by entrepreneurs and should also be used by firms		Good. - Incoproates the VC way. - Evaluate as the idea develops		
Hedvall			Good. - Used by entrepreneurs and should also be used by firms				

Table 4-7. Empirical Findings – case studies. Methods part 1

Methods	Dragon's Den	Portfolio Management	Pitching to management	Prototypi	Balanced Score Ca
Alfa Laval		- Early activity		Yes	
AstraZeneca		- Early activity. - Risk and newnesslevel included	Yes. To higher management for financial support	Yes	
Swisslog		- Risk and newness level included	Yes. To higher management	Yes	Weights criteria
Company Y		- Risk and newness level included - Different at business units - Influenced by innovation strategy		Yes	
Hype		- More firms should use it - Focuses pipeline - Also done by Herschel and P&G - Common: Include time-line, Impact level, Risk, Newness Level - Helps to compare ideas and push radical innovations	Common procedure among firms		
Company X			Yes. To sell ideas to business units and higher management	Yes	Yes

Table 4-8. Empirical Findings – case studies. Methods part 2

Methods	Open Innovation Crowd Sourcing	Customer Development Lean Start-Up	Business Model Canvas	Hackathon
Alfa Laval		For very radical ideas, they are inspired by this		
AstraZeneca				
Swisslog	Crowd sourcing			
Company Y	Open innovaiton	Very close to		
Hype	Several firms use crowd sourcing - Problem: Crowds might lack skills to understand potential of radical ideas			
Company X	Crowd sourcing			

4.3 Criteria

The following tables present the main empirical findings regarding which criteria to include throughout the screening process. Firstly, there are two tables, 4-9 and 4-10, representing the findings from the experts, followed by two tables, 4-11 and 4-12, representing the findings from the multiple-case study. The themes that were identified by the authors regarding the type of criteria to use in the screening process were *Not too detailed in the beginning, Showstoppers/Thresholds, Compete ideas against each other, Market, Environmental Analysis, Technological Feasibility, Strategy & Vision, Financial Assessment, Soft Sides, Time, Risk* and *Business Model Canvas.* The multiple-case study also revealed the theme *Regulations.* Looking into the tables, an understanding can be gained regarding for example how showstoppers could be used and which companies and experts that advocate the use of them. Moreover, the theme *Market* provides insights as to what the different interviewees believe regarding the involvement of customer feedback and market potential, whereas *Regulations* present which companies use regulations as a criteria in the screening process.

Table 4-9. – Empirical Findings – expert interviews. Criteria part 1

Criteria	Not too detailed in the beginning	Showstoppers/threshold	Compete ideas against each other	Market	Environmental analysis	Technological feasibility
Elerud -Tryde						
Brasta						- Newness level
Hedvall	- Cannot find diamonds too early.	- Do not look for the best ideas, but rather good ideas without showstoppers.		- Desirability and market potential. - Potential to become really large.	- Competitive situation. - You need to know what is going in the rest of the world.	
Gartner	- Look for things on a pretty high level.	- Company states clearly what they are looking for, i.e. threshold, and only accepts ideas within those areas.	- Test ideas in a smaller scale and see which one has the best benefits.			- Right level of disruption
Bessant	- Questions are very straightforward at an early stage, and just need some simple answers.		- Ideas from the same area should be weighted against each other, providing a balanced portfolio based on risk and reward.	- Find the customer need, no use trying to develop something unwanted. - Market opportunity.	- Competitive situation.	- Internal technical competence.
Wockatz	- Many filters, being nice in the early filters, tough in the latter filters.		- Need a good portfolio mix, small, medium and high bets. - Compare ideas from the same area. You cannot operate in "vacuum".	- Desirability is the priority, first see if the idea is solving a customer problem, then look into how to make money.	- Competitive situation. - Transactional and non-transactional environment. You cannot operate in "vacuum".	- Technological feasibility, should come after desirability.
Expert A	- Rough assessment in the early phases, allows the idea to develop further.			- Solving an existing customer problem. - Market opportunity. - Potential to become really large.		- See if it is doable.

Table 4-10. Empirical Findings – expert interviews. Criteria part 2.

Criteria	Strategy & vision	Financial assessment	Soft sides	Time	Risk	Business model canvas
Elerud -Tryde	- Strategy affects portfolio and thereby affects the ideas they take on.					
Brasta	- Not everything needs be aligned with strategy, 50% traditional business, 50% cannibalise the traditional business, contrary to strategic goals.			- Time to evaluate and implement is a desired parameter.	- Important to have risk or uncertainty as a parameter in the portfolio.	
Hedvall		- Rough estimates, no point in calculating ROI early on, just verify no obvious hinders. - Potential to become really large	- Personality of the entrepreneur.	- Time to market.		
Gartner	- Scope phase; strategy & vision can set themes for innovation initiatives, such as jams.	- Look into business benefit in the first cut.		- Look into time frame in the first cut.	- Risk benefit analysis.	
Bessant	- A clear strategy provides a fairly strong set of criteria and a strong set of questions. - Strategic fit can decide whether to pursue an idea or not.	- Straightforward questions, regarding e.g. market share or revenue increases.			- Risk and reward as criteria in portfolio thinking.	- Business model canvas provides key questions.
Wockatz		- Viability, last thing to look into, after desirability and feasibility.	- The person needs drive and motivation. - Looks into team dynamics and team competencies.		- VCs look at three types of risk; technology risk, market risk and entrepreneurial risk. - Ron Adler's lenses; execution risk, adoption risk and co-innovation risk.	- Business model canvas a bit tricky, concept canvas instead.
Expert A	- Strategic fit to be used to determine whether they should do it inside the company or let someone else, e.g. employee do it.	- Potential to become really large.	- Separates idea from individual when evaluating but always evaluates the individual.			

Table 4-11. Empirical Findings - case studies. Criteria part 1.

Criteria	Not too detailed in the beginning	Showstoppers/threshold	Compete ideas against each other	Market	Environmental analysis	Technological feasibility
Alfa Laval	- Should not be too detailed in the early phases.	- Showstoppers is the first thing they look for.		- Customer value, no use trying to develop a product that nobody wants.	- Competitive situation.	- Small assessment of how difficult it might be to do.
AstraZeneca	- Not a strict set of criteria.		- Early on compare different opportunities.	- Market need, based on disease segments rather than specific solutions. - Market value estimation.	- Insights from foresight, trends and competitive analysis.	- Technological feasibility.
Company X				- If the idea meets the addressed problem.		- Technical feasibility. - Uniqueness.
Hype	- As the screening proceeds, the questions are answered with much more detail.	- Choice of ideas often based on thresholds.	- One cannot compare different innovations on the same metric. - Compare choices with doing nothing.	- Desirability. - Market attractiveness.	- Competitive situation, however seldom used in companies.	- In the early stages, look for feasibility.
Company Y			- Compare to existing projects.	- Customer needs and the extent to which the customer needs can be fulfilled.	- Competitive situation	- Technology difficulty. - Uniqueness.
Swisslog				- Desirability; if the idea is not desirable, kill it.	- Competitive situation.	- Technological feasibility

Table 4-12. Empirical Findings - case studies. Criteria part 2

Criteria	Strategy & vision	Financial assessment	Soft sides	Time	Risk	Business model canvas	Regulations
Alfa Laval	- Strategic fit. - Restrictions from board regarding products in certain categories.	- Assess If financially good, however hard to know in the beginning.				- When really radical, customer development process.	
AstraZeneca	- Restrictions from board management defines five areas in which they want ideas.	- How valuable.		- Due to long time frames, a lot of guessing.	- Risk as one of the parameters in the portfolio.		- Strong industry regulations --> the criteria include those of all regulatory bodies overlooking pharmaceuticals.
Company X	- Alignment with company strategy.	- Business impact. - Potential cost. - Needed resources and funding.					
Hype	- Use strategy to set themes for ideas.	- Financial metrics in the early phases.					- Look for regulations
Company Y	- One can only satisfy needs in the adjacent areas if they are aligned with the strategy and brands you have.	- Economic potential can only be judged if you have done something similar before.			- Market risk to fail. - Technology risk to fail.		
Swisslog	- If not aligned with strategy, low chance of success.	- Viability.		- Build in time frame.		- Customer development process for developing new things.	

4.4 Stakeholders

The following tables present the main empirical findings regarding the stakeholders that are affected by and that affect the screening process. The tables have been divided into three areas; Individuals, The Group and Management. Firstly, table 4-13 represents the main findings from the experts regarding individuals, where the following table, 4-14, represent the findings in the same area from the multiple-case study. Table 4-15 presents findings from experts regarding The Group, whilst table 4-16 presents findings from the same area but from the multiple-case study. Similarly, table 4-17 present the outcome from the expert interviews regarding Management followed by table 4-18 presenting the findings from the multiple-case study. In the tables regarding the individuals, the authors identified the themes *Inclusion of Idea Generator, Entrepreneurial Traits* and *Others.* In the area regarding The Group, the identified themes were *Experience, Knowledge* and *Experts and Additional Inclusions.* Lastly, the themes that were identified in the area of Management were *Different Management Support, Inclusion of high management, Management can affect culture, Politics* and *Pitching ideas to management.* The theme *Educate* was further identified in the multiple-case study regarding the area Management. The different tables and the different themes represent the interviewees' views and thoughts regarding the different subjects. For example, some advocate that the idea generator should be included; others argue that burning platforms are essential, see *Entrepreneurial Traits.*

Table 4-13. Empirical Findings – expert interviews. Stakeholders, Individuals.

Individuals	Inclusion of idea generator	Entrepreneurial Traits	Others
Elerud-Tryde			- Whole FEI can be regarded as stakeholders and interactions. - A dimension: are people comfortable with presenting their ideas?
Brasta	- Can motivate people to be given possibility to develop the idea. - Should not be required.		
Gartner			
Bessant			
Wockatz	- Idea Vessel and Carrier not necessarily the same - Ideas can sometimes be communicated in a way so they do not need to be included	- Intrinsic motivations. Not looking for quick exits. - Important to consider.	
Expert A	- Do not separate in beginning - If right type. - Know-how gap. - Simulate VC process.	Very important to consider Looks for: - Curiosity. - Drive. Can handle failures. - Do not forget the burning platform and possible great rewards for entrepreneurs.	
Hedvall	- Do not separate in beginning. - Know-how gap.	Look for: - Intrinsic motivation. - Values commercial and technical work equally. - Understands external world. - Do not forget the burning platform and possible great rewards for entrepreneurs.	

Table 4-14. Empirical Findings – case studies. Stakeholders, Individuals.

Individuals	Inclusion of idea generator	Entrepreneurial Traits	Others
Alfa Laval	Yes if right type of person. Cannot always be done.		
AstraZeneca	Yes, sometimes.		
Swisslog	The process need to let all play. Even the shy who do not want to.		
Company Y	Yes. It works like a reward		
Hype		- Also important to find burning platform.	
Company X	The choise is given	- Passion. - Motivation. - Find the burning platform.	

Table 4-15. Empirical Findings – expert interviews. Stakeholders, the group

Group	Experience	Knowledge	Experts and additional inclusions
Elerud-Tryde			
Brasta		- Include the relevant business unit in the process	- Include business units for knowledge and relevance.
Gartner	- Skills for high newness level innovation is based on a lot of experience	- Need to see strong link between technology and business to bring a solution	- Include related business unit.
Bessant	- Need people with an accumulation of knowledge	- Need real understanding of market and technology development - Should represent number of perspectives	- Invite relevant experts to help judgement.
Wockatz		- Need a cross-functional team	- Likes to include experts for knowledge. - Experts should not single handily evaluate ideas. - Include business units.
Expert A		- Someone need to know, or know someone who knows, the technical aspects and commercial system in which the idea should fit.	- Exact same team cannot evaluate every idea. You need new knowledge
Hedvall	- Good if evaluators have experience from thought market - Not only junior employees	- Members need to have mutual respect for the areas market and technology. - Understand and know the outside world. - Include someone who represents the idea's application	

Table 4-16. Empirical Findings – case studies. Stakeholders, the group

Group	Experience	Knowledge	Experts and additional inclusions
Alfa Laval	- Have same core team that works with radical idea screening. - Four people with different experiences and backgrounds.	- Marketing not represented per se. But people screening need to know and respect it. - Includes business segments.	- Includes experts throughout
AstraZeneca	- Have same core teams that works with radical idea screening.	- Cross-functional teams.	- Uses information from other business units.
Swisslog	- Have same core teams that works with radical idea screening.	- Thinks it would be positive to include different regions marketing and sales functions. Marketing not always represented today.	- Involves business units.
Company Y	- Have one core team.	- Cross-functional teams.	- Includes experts throughout. - Identify and include lead customers.
Hype		- Firms should include people from e.g. marketing, sales, quality and operations.	- Firms need to complement core team with expert knowledge per idea area.
Company X	- Have a team developing the ideas.		- Includes experts throughout. - Involve and sell to business units.

Table 4-17. Empirical Findings – expert interviews. Stakeholders, management

Management	Different management support	Inclusion of high management	Management can affect culture	Politics	Pitching ideas to management
Elerud -Tryde				- Evaluation process dependent on what the people involved have to gain or lose related to the idea.	
Brasta		- Strong leaders important to point at long-term transformation of the firm. - Business units should be involved in prioritising ideas related to their area.	- Management can create an open culture by being accepting of weird ideas.		- Provides a culture and shows off support.
Hedvall			- The use of incentives. - Instead of burning platforms, use incentives to get people out of their comfort zone.		- Try to simulate a start-up and VC process.
Gartner	- Management support dependent on input. - Include affected stakeholders in the screening.			- A governance committee will tend to focus on their own problems and how to solve them, rather than to focus on things that might make their lives a bit tough for a little while.	- Shark Tank/ Dragon's Den a type of initiative where employees pitch ideas.
Bessant	- Not one system for everything. Probably less effort managing incremental innovations than disruptive, crazy things.	- Keep senior managers well aware throughout the process, they have the resources. - Team of senior managers risk being to narrow, not taking expert views into account.	- Management can create a safe structure for employees. - The screening process affected by providing an invitation from the top.		
Wockatz	- Top down or bottom up processes for innovation require different types of management support.	- Not explicitly senior management support, rather people with decision-right and the ability to influence others.		- The most important way to mitigate politics in the screening process is to standardise the process and the criteria.	- Expert views not enough in screening. - Create a process with many filters, finishing in a Dragon's Den event, followed by the use of crowds in the selection.
Expert A		- Management might sometimes affect the failure of an idea, rather than the idea itself being bad.	- The use of incentives. - Offer employees e.g. Shares, when developing ideas that become successful.		- Try to simulate a start-up and VC process. - Never separate the idea from the idea carrier.

Table 4-18. - Empirical Findings - case studies. Stakeholders, management

Management	Different management support	Inclusion of high management	Management can affect culture	Politics	Pitching ideas to management	Educate
Alfa Laval		- Regular meetings with top management to inform. - Provides restrictions regarding product categories.				
AstraZeneca		- Higher Management defines areas from which they want ideas.	- The CEO is very present in the projects; good for development.			
Company X		- Senior managers or business leaders should act as sponsors.			- Use the same type of set-up as for a Dragon's Den event. - Final round, pitching to internal senior executives.	
Hype		- Higher presidents can be evaluators, only assessing the best ideas that the community has voted for continuously.			- Many companies have people pitching for a certain pot for radical innovation.	- Creator should not pitch, lack of skills. Leave it to the experts.
Company Y		- Higher management assess initial risk and impact.				
Swisslog		- Higher management should not be involved in the screening; a lot of experience, risk being too narrow. - However critical because of budget and resources.	- Important to give everyone a chance to be involved. - Used iPad as an incentive once, hard to tell if it made a difference.		- Interviewee mentioned previous work at Bombardier: used Dragon's Den as an internal VC approach. - Made people motivated and brought forward passionate people.	- At Bombardier: Educate and coach employees who lack certain skills in the process of building a business case.

5 Analysis

This chapter aims to compare and contrast the above-presented findings regarding knowledge within literature, expert's knowledge, and today's best practise. The analysis chapter follows the same structure as chapters *2. Literature Review* and *4. Empirics.* Each sub heading starts with comparing and contrasting the literature with expert knowledge, to address SRQ1. Then, firms' best practises are compared with each other, to address SRQ2. These are then further contrasted with literature and expert knowledge to serve as a basis for the discussion chapter that will answer RQ. Figure 5-1 below shows the relationship between the different studies and the research questions. Each sub-chapter is ended with implications for how to set up a process for large firms' screening of potential radical innovation ideas, providing the basis for the Discussion chapter that will culminate in answering RQ. To ease for the reader, case-study interviewees will be addressed through their company names. The analysis is presented in sub-headings that represent the themes this report's writers identified.

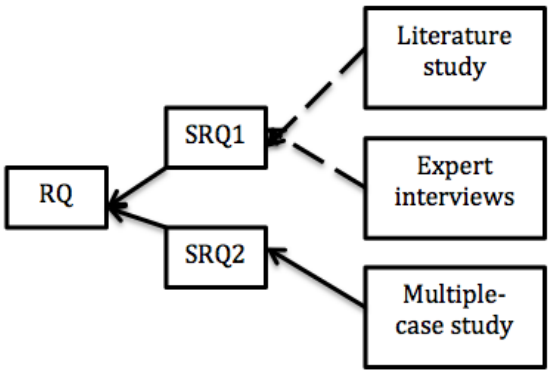


Figure 5-1. Structure of the analysis

5.1 Structure

The screening process can be initiated in various ways, where Elerud-Tryde mentioned that it can be everything from a set process by the firm, to that anyone at the firm can have an idea to bring forward. Wockatz however said that for ideas to get through some large firms, the process needs to be planned through a jam, or related to project planning, or be a standardised process. Otherwise, it will be hard to receive adequate interest. Gartner also mentioned that different types of inputs for varying initiatives have different processes, especially if they are targeting different types of initiatives such as jams vs. process improvements. The origin of ideas is not discussed as influencing screening in the reviewed general screening literature, but it however seems to be of importance in practise. Hedvall further mentioned that they adapt the screening process of entrepreneurial ventures to different markets and the application, where *exempli gratia* pharmaceuticals are highly restricted and require more time and money compared to a web page. The difference lies in time needed, and number of dialogues required with investors. Expert A also emphasised that different technologies will take very different time to develop, also emphasised in both FEI and entrepreneurship literature. These statements are in line with *exempli gratia* Gaubinger and Rabl (2014) who adapt their screening model by innovation type (technology or market) and newness level. Cooper (1988) and Koen et al. (2001) do however not discuss this, but is seems clear that it does matter: especially when regarding radical ideas since they have high

newness level. Bessant said that there cannot be one system for everything, as crazy, new things need different management, also in line with Gaubinger and Rabl (2014), Koen et al. (2001) and entrepreneurship literature, further implying it to be the case. Expert A however thinks that the development process for services vs. product innovations will not be different, apart from that services may take less time. This relates to the identification of that FEI literature does not mention services when discussing screening.

As stated by the literature and experts, Hype, Company Y and Alfa Laval highlighted the importance of having a separate and different process for radical, new-to-the-firm innovation ideas compared to that of the NPD. All studied companies have had this. Alfa Laval explained that these kinds of ideas need special care and attention to not get knocked down immediately in the company. This is in line with Expert A and Hedvalls statements, and Bessant *et al.'s* (2010) empirical research. Further, the evaluation *per se* was different for radical vs. incremental innovation ideas in some firms. Hence, a categorisation of radical and incremental ideas is SCA's first screening, and Swisslog uses a model to separate radical ideas into a specific FEI process, as they need time to develop. Hype, helping many firms with their screening process, validated that this is common practise at most firms. Several firms mentioned having both continuous idea flows into set screening processes, as well as pre-defined jams or campaigns, in line with Elerud-Tryde and Wockatz statements, as well as Gartner's observation. Firms using both includes AstraZeneca, Company X, Swisslog, and according to Hype also many others. These have different screening processes, although Company X and Swisslog mention that the processes are similar, where the screening criteria at *exempli gratia* Swisslog follow the same overarching areas. This is an addition to the literature, not stating the process generating the ideas to influence or be part of the screening process (apart from Elerud-Tryde and Soonvald, 2011). Both representatives from Company X and Hype mention the use of campaigns to be better, which is an interesting insight despite the fact that Hype is a provider of software for idea jams. Company X mentioned that the campaigns are targeted, built on a burning platform that provides management interest, and starts with a well-established sponsorship within the firm. Random ideas are not always in response to the business' needs, or aligned with priorities or business issues. During campaigns, the screening starts for the firms when they decide themes for the campaigns, Hype explained. For continuous idea flows, the screening process needs develop a momentum, and work harder with finding implementation. So, in terms of return on effort, campaigns deliver far better results. Hype mentioned the same arguments as Company X's for campaigns to be better, and also highlighted that campaigns teach employees *"how it's done"*, so if a continuous process is to be used, he recommended to start with campaigns and then parallel with continuous idea submissions, which are divided into themes with a person attached to each theme. And, continuously submitted ideas of interest can be further developed through the use of campaigns. He however said this type of set-up can follow the same screening process as for jams, but with other screeners. Through this, the different themes can be related to company strategy, vision and interests. The discussions of Hype and Company X relates two ways to literature. First, the discussion of burning platforms and finding sponsorships highlights the entrepreneurship literatures', as well as Hedvall's and Expert A's, emphasis on the softer issues with screening. This as they advocate that stakeholders, motivation and need for a burning platform, and educating employees in how to pitch and screen, are important parts of screening management. This is not emphasised in FEI literature. Secondly, the

preference of campaigns' themes shows companies' preference of strategy influencing the screening process, which is also stated to be preferable in the literature and by experts.

Even though it is not stated in the reviewed literature, it seems like there is a difference in screening for ideas generated from jams and continuous submissions, as both expert and case study findings states it. This seems to be as they are built on burning platforms, have sponsors, and are also clearly related to the current business goals. However, many firms combine jams with continuous submissions, which Hype pointed out to be positive. This combined with the fact that Volvo already succeeds in using jams and has a set process for it, a screening process for continuous ideas seems to be a good next step for the firm. This however implies that the areas of sponsorship and relating the idea to a business need or other burning platforms are of interest to regard when formulating the process. Hence, Hype's recommendation of having overarching themes to provide ideas in relation to could be positive. It also appears like differences in idea types bring differences in the time needed to look into areas, and what areas that need more attention, rather than that they would require different processes. This also implies that the knowledge gained from Company X is relevant, even though the studied innovation team focuses on services innovations.

5.1.1 The process design

Similar to the literature, interviewees also spoke of the tension between flexibility and control. Elerud-Tryde said that the FEI can be standardised to some extent, as a process of some sort can be developed, where Wockatz said that it can neither be too detailed nor too unstandardized. As the discussion in the literature reviewed, interviewees said that there is no exact answer for how all firms should strike the balance between flexibility and control, which seems to be the case. However, pros and cons with the options that are not mentioned in the literature were brought forward. Wockatz explained that screening needs to be standardised enough for people to understand it and that it mitigates the politics and uncontrollable gut feel in the process. Moreover he explained that that it can be dangerous to present different processes for screening to a large firm. Instead, one should use *exempli gratia* modules in various phases to make it flexible. This is in line with the model presented by Gaubinger and Rabl (2014), and the screening model presented by this report's authors in the conclusion chapter of the literature review, see heading *2.4 Conclusion*. Bessant similarly explained that organisations sometimes need the discipline of stage-gates and rigorous procedures where there is a high uncertainty. Wockatz however also emphasised that the process needs to be able to adapt to local needs. Expert A pointed out that people driving the idea need to gain access to all required information, and should not be hindered by bureaucracy. Hence, it seems like both flexibility and control have desirable outcomes.

To continue the initiated analysis of the stage-gate model, Expert A explained that this setup is ridiculous to use for ideas that are not incremental, where every decision is not as black and white as using standardised checklists. Instead, he recommended simulating the VC process for new-to-the-firm ideas, without separating the idea carrier from the idea, who has total responsibility, a burning platform, and continuous reviews of progress. Bessant said that stage-gate processes also can be too tough, throwing out valuable ideas, as they need time to iterate, pivot and grow. In contrast, Wockatz said that not having a stage-gate process can cost you a lot if you do not have control, but that it should be iterative, where gates can be skipped or redone and rather regarded as checkpoints. This is more

similar to the view of Gaubinger and Rabl (2014) and Koen et al. (2001), rather than Cooper's (1988) representation of the stage gate model. Bessant explained the typical process from the stage-gate point of view, validating the model brought forward by this report's authors. He explained three checkpoints, where the first gate would involve realising if the idea is an interesting opportunity or not, followed by finding out a little bit more building a business case light, followed by more detailed concept exploration. So, it seems rather that the way a stage-gate model is designed to allow for flexibility and control is more the pressing issue to regard when designing the screening process, than having checkpoints and gates per se.

Further, Bessant, Wockatz, and Expert A all agree with literature that screening is a process, culling generated ideas, which should start easy and later be harsher with tougher questions. Interviewees however give additional insights as to why this is. Firstly, Expert A emphasised the VC way, where ideas are developed through the customer development process as the idea progresses and develops. This relates to that Elerud-Tryde, Expert A, and Hedvall, which all explained that the ideas are not great at the beginning, due to high uncertainty, where Hedvall and Expert A say they do not look for the perfect idea, initially, and that ideas need time to grow. This viewpoint is not emphasised in the FEI literature. Secondly, Wockatz emphasised a mathematical principle, stating that to receive the best ideas, you also need to put the worst ideas through in the beginning. Otherwise, you end up with only the middle ground ones. Similar to the entrepreneurship literature, Hedvall and Expert A emphasise that entrepreneurs work with building their case step by step. Venture capital is required along the way at different points in time, where entrepreneurs and their venture are evaluated, possibly giving more money, revising, etc. They would both recommend large firms to learn from this process. Bessant also recommended running ideas with high newness level like an entrepreneur in firms, with pitching to internal venture capital representatives, so the ideas can be developed and be turned into something good. Wockatz advocated that firms should have several filters in a lean start-up setting.

An important note not made by the literature, that one must regard when designing an idea screening process for potential radical innovation in a large firms such as Volvo, is that it will not be the same idea that is screened throughout the process. Further, it will probably not be great in the beginning. Even the literature advocates rooms for exploration and changes, whereby it seems likely that the idea that will develop, iterate and change, cannot prove to be great at the beginning of the process. Hence, it also seems likely that the screening process needs to be allowing in the beginning, and based on stepwise refinement, which is clearly stated by all three bodies of sources.

Alfa Laval, SCA, and Swisslog have set stage-gate processes for the FEI and screening of potential radical innovations. The three firms align with the process compiled from literature in figure 2-9 on a holistic level. They include a first phase focusing on whether the idea should be explored further or not, a second phase of iteration and exploration where the idea(s) develop and are tested with prototypes, and a third focusing on developing a business case before it is to be handed over to others for the NPD. This is usually done through selling the concept further internally or to convincing higher management of a go-decision or further funding. The companies hence highlight the end-use of the business case as a selling argument dependent on the receiver, which is not highlighted in FEI screening literature. Further, as also discussed in literature, the stages are focused on testing, gathering information, lowering

uncertainty, culling ideas, and building a case/concept. The three firms also focus on the technology part of the concept in the later stages, and customer needs and application in the first stages. The firms are further in line with the literature stating that specific people should be assigned to the screening process, which should be outside the current practises.

The firms' stage-gate processes however also have differences and highlight varying aspects. The early group discussions in phase 1 at Alfa Laval is in line with the literature stating that "nice", qualitative methods should be used in the beginning. Two activities separates Alfa Laval from the other two firms with stage-gate processes: the drafting of an initial A3 document for deciding whether to pursue the exploration and development of the idea, which happens before the stage-gate process. Secondly, the firm mentioned that the screening process works towards reaching setup milestones, and that they focus on finding showstoppers early on. The latter is in line with the process of Hedvall, and also Expert A's initial check that the technology is not impossible. Showstoppers are not mentioned in literature, which instead focuses on enabling factors. However, it can have potential, as it has been shown that the process should be a culling activity that allows for many ideas initially. Further, external stakeholders are explained to be included after the three stages. Company Y explained a different way of working compared to the other firms. After a radical concept has entered the stage gate, it will be judged by a risk/effort/potential matrix, which includes financial estimations of failures and costs, done by senior executives. Hence, they mention early management inclusion, as well as assessing risk early on. This is however said to be very rough and only used to tell obvious misfits. If the idea progresses, the next stage is to evaluate its potential in a set time frame of six weeks. Lead customers are identified, and the firm wants to work close with them. Company Y explained that this is very close to the customer development process. Then, the idea is concretised into a concept, where the firm focuses on adding further value for both customers and the firm, and the feasibility. Swisslog emphasised that further ideas can be generated in phase 2, where iteration and exploration takes place to develop and test the radical ideas. This was not mentioned by the other firms, and relates to the reviewed entrepreneurial literature explaining generation and evaluation to be dependent activities. Another thing that was different with Swisslog compared to the other companies was the focus on a design driven approach, and that the development of *one* specific concept is at the end of phase 2. The firm encourages that several applications should be kept in mind. Continuously submitted ideas are screened every three months. Both continuous and campaign related ideas are firstly evaluated as being related or unrelated to desired areas, then clustered into themes, where the jam related have already have set owners. In the third stage, reviewers from the relevant business units review the ideas and choose which ones to progress with. For continuous ideas – as there is not a set need initiating the generation – three to four business units review the concepts so that a match where it can be most valuable is found.

Hype explains a difference with campaigns, where several additional initial screens are done in firms before the ideas enter the development, i.e. in phase 1 according to the compiled literature. Many firms let community opinion do the first initial screen, as a team cannot evaluate 1000s of ideas. Then, a screening team will skim through the ideas and do a qualitative yes/no assessment, which often does not depend on bad or good ideas but rather whether it is relevant for the theme and the firm's priorities. This once again validates literature, stating that qualitative easy assessment methods are

used early on. A third qualitative stage is usually conducted through score-carding to rank ideas towards each other. Then, sponsors choose what ideas to further explore and develop, to build a business case.

AstraZeneca and Company X did not use a stage-gate process. AstraZeneca does not use a set process for screening ideas. As the other firms and in line with theory, *exempli gratia* Blank and Dorf (2012) Koen *et al.* (2001) and Gaubinger and Rabl (2014), AstraZeneca do have a very iterative process, but it is coloured by the industry's long time frame, low success rates, and strong regulations. This is related to Alfa Laval's statement, that one of the most important things the interviewee has learned is that screening and innovation work is, and should be, different from company to company. As industries of large firms are very different, and the firms have had differences within their similarities, it seems indeed like it is important to regard the firm and its industry when designing a process for radical idea screening. This highlights the FEI literature discussing the need for flexibility and letting the strategy, company culture and outside world influence the process (see *exempli gratia* Koen *et al.,* 2001). At AstraZeneca, ideas that need money for piloting are pitched to higher management. The firm further sets its process apart from others through its continuous inclusion of foresight work, trends, guest speakers and the like, used to form decisions and rethink concepts throughout the development process.

Company X also has a different process for the screening of continuously submitted ideas compared to those generated in a campaign. For continuously submitted ideas, the team starts with locating where ideas fit within the firm. Then, the team tries to build a business case and sell it to the relevant business unit, and develops the idea further based on received interest within the company. The firm focuses on finding the burning platform within the company early on in the process, which it does not need to do for ideas driven in by campaigns. This firm leaves more to the business units, and focuses on building a business case that gets the idea sold, after which others in the firm continues to develop the idea. The innovation team here more focuses on locating the right internal adopter. However, the team does, as all other firms, evaluate the ideas in several stages: two to three times most likely, and also sees this as a culling activity where very few goes through to the final round. This is however not the only way this is done within the firm, but the most common one.

The tension between flexibility and control that is discussed in literature by Martinsou and Poskela (2009), Gaubinger and Rabl (2014) and Boeddrich (2004) does indeed seem to exist in firms' daily practises, and it seems that both are needed. Since Volvo is a large, global firm with several divisions, it seems important to take into consideration that a standardisation mitigates the gut feel and politics, and provides some consistency. This does not necessarily mean that it is standardised to the extent that it hinders screeners, or does not allow for radical ideas to go through it, as the firms with stage-gate processes have successfully incorporated many aspects of entrepreneurship, iteration and exploration within it. Further, it appears like the three overarching phases presented in the literature is also successful to incorporate when a process for radical idea screening is setup for large firms, as three of the firms have done it successfully, and the ones who do not do it same perform the activities. Thereby, it seems like the process should be a culling activity full of iteration and exploration, where the first phase briefly explores whether the idea should be further developed and evaluated, the second step iterates, test and prototypes the concept through building a business case, and the third phase specifies

the business case to the extent that an NPD go/no-go decision can be made. As the firms have had differences within their processes, it also seems like there really is not one system for everything. However, there are clear themes to regard when designing the process, which are true for all studied firms. Stakeholder management seem to be more important in practise, than the literature has stated. Further, no firm explicitly mentioned the process to vary between services and product innovation ideas. It is interesting to note that the stage-gates allow for much iteration, and not only check-lists but rather checkpoints, as advocated by Expert A and Wockatz, and that firms do try to find burning platforms within the firm, as stated to be of interest above. Expert A and Hedvall however discussed the importance of burning platforms for the entrepreneurs themselves. This has been analysed previously above. The firms' stage-gate processes have resemblances to that presented by Cooper (1988), but are more similar to the essence of the screening and FEI representations presented by Koen *et al*. (2001) and Gaubinger and Rabl (2014), and with that presented by this report's authors in the literature review.

Alfa Laval also mentioned that when it comes to very radical ideas, they step away from the above-described process, build more proof than normally, with a separate cross-functional team with inspiration from Steve Blank's customer development. Company X teams up with universities through incubation to receive additional prototyping and development for more uncertain ideas that can have potential, whereby the idea later on can gain much more momentum in a later stage in the firm. This highlights the politics and need for the concept to be fully explored to be 'sold' to management, which is not emphasised much in literature. AstraZeneca also thinks they will spin-off more than before, due to their new strategic focus and as they have started to invite start–ups and small biotechs to use their facilities and receive their expertise. This implies a higher radicalness level than the in this report defined 'new to the firm', which requires a step outside the radical idea screening process to be proposed.

5.1.2 The end result

Brasta explained the end-result of the evaluation process to include one shorter decision support document, with a concrete business case, and one selling, visionary and exciting part, of which both is needed to convince managers. He was the only expert to speak of the latter part. Bessant and Wockatz also spoke of business cases to be the screening process' end-result, in line with reviewed literature, of which both mentioned the business model canvas to be good, since it provides a coherent narrative and grounds the innovation in reality. This highlights this report's writers' conclusion that it should be addressed in the FEI literature, learning from that of entrepreneurship. Wockatz however highlights that in practise, the business model canvas can be hard for people to understand, whereby he sometimes prefer to use a light version of it. He also highlights that the screening process should end in clarifications regarding desirability, feasibility and viability, and then 'who is the entrepreneur?'. The latter is also emphasised in the entrepreneurship literature rather than the FEI literature, as well by Expert A and Hedvall.

Similar to literature and experts, studied firms have a business case or concept as the end product of the screening process, that is presented to higher management, or used to sell the idea for further development to business units. For Alfa Laval, however, this looks a bit different depending on what

type of idea it regards, even though a business model is common. Company X also refers to it as building a story, and preferably a business case, and states that the firm has guidelines for how a business case should be put together. This is true for Company X's always on and campaign generated ideas. Swisslog also emphasised that the business case used for pitching to higher management needs to be both interesting and convincing, which is in line with Brasta's point of view. Even though the use of a business case is in line with literature, literature does not state the importance of realising it is to be used for pitching, convincing, and gaining interest from other business units or higher management. However, this seems to be an important factor to consider. Hype also stated that firms usually do use business cases, which is a good outcome for radical ideas but might not suit all innovation types. The use of a business case seems to clearly be suitable to use when designing the screening process of radical ideas for large firms.

5.2 Methods

A number of the methods mentioned by experts to be good for firms to use when screening are also mentioned in the literature, where several are influenced or directly taken from the field of entrepreneurship. However, the interviewees mentioned reasons for why methods are interesting to use for large firms when screening ideas for potential radical innovation that the literature does not explain. Brasta mentioned the Dragon's Den idea, also mentioned in the literature review (Bessant *et al.,* 2010), to be good, as it provides a culture in the firm and shows off support to employees. Bessant explained that the Customer Development process and the Lean start-up model – both mentioned as suitable in the literature review, taken from the field of entrepreneurship – ensure that ideas with high newness level in firms can be developed, so valuable ideas are recognised for their actual potential. He also said they force people to think about markets and technologies and major uncertainties, and promotes coherency through the business model canvas, as previously mentioned. Wockatz explained that these methods help to include the best and worst ideas early on in the screening process, which is needed for great radical ideas to be found later in the process. He also said that the Dragon's Den helps simulate the VC process so that not only a few experts do one evaluation. This was also seen as a positive thing to do according to Hedvall and Expert A. Wockatz further explained that lean concept development and the business model canvas help anchoring the idea in an actual customer problem, to identify key stakeholders, and makes ideas more mature when they are evaluated. He further recommended the Hackathon, not mentioned in literature, where a specific number of days are given to teams to evaluate different areas of the concept. This is the same as SCA's time-limited evaluation as part of their stage-gate model. Teams then pitch, and are provided with champions and money if they are convincing, and then they continue to evaluate. This also resembles the VC way, as advocated by Hedvall and Expert A. The other methods mentioned in the literature were not brought up by experts. These methods all include pitching ideas, which was also discussed in literature as being used by many firms, and showed through the empirical case studies.

Almost all firms use a portfolio management method when assessing ideas, which is also mentioned in literature. Both Alfa Laval and AstraZeneca mention it to be an early activity, and Hype sees it as very positive and advocates that more companies should use this. AstraZeneca and Swisslog highlight that the portfolio then have different levels of risk and radicalness in it, which ensures that the firms have both safe and more risky bets. Company Y explained that the number of radical vs. incremental ideas

you want in the portfolio is influenced by the different business units' innovation strategies, and whether the firm want to be a follower or leader within the business areas. Hence, this method also relates back to literature advocating the importance of firms letting their screening process be influenced by their business and innovation strategy (*exempli gratia* Koen *et al.,* 2001: Martinsou and Poskela, 2009). Hype further mentions that this forces the firms to focus their pipeline, and explains that Herschel and P&G *exempli gratia* work with portfolios in their screening process that are based on time-line, business impact level over time, risk and market impact. The threshold deciding what is radical and incremental in the portfolio could for example be level of impact and uncertainty, and the balance of this will change over time depending on their economic position. The case studies hence provided many reasons for why to include portfolio management in the screening process, which the literature did not, and it seems like it is used to categorise ideas based on radicalness levels. It also relates to the statement that the FEI needs be holistic and related to the firm's portfolio (Khurana and Rosenthal, 1998), which means firms can gain maximum value (Martinsou and Poskela, 2011). Related to the discussion of risk is also SCA's risk matrix used for the initial screening of radical ideas.

Many firms also discussed that ideas will be pitched somehow in the company through the use of business cases, which much resembles the methods of VC, customer development and lean development discussed in both literature and by several experts. Case studies showed that Dragon's Dens are used in for example Bombardier, and the research by Bessant *et al.* (2010) states that this is done by many more. Swisslog, Company X, AstraZeneca, and Hype all explicitly discussed that ideas are somehow pitched internally. In several firms, the ideas are pitched to higher management after they have been developed and defined to some extent, as in *exempli gratia* AstraZeneca, Company X, and Swisslog, which was mentioned by Hype to be a common procedure in firms.

A method mentioned by many firms, but only briefly touched upon in literature, is the use of prototyping and piloting to test, explore, and develop radical ideas and concepts for both market applications and technology development. This is mentioned by Alfa Laval, Astra Zeneca, Company X, and Swisslog. Alfa Laval mentioned that it can be used even when the application is not known, where prototypes become more detailed as the uncertainty level is lowered throughout the process. Company X also said that they aid in support and selling ideas, whereby they encourage it.

Another method mentioned in literature, also used in firms, is balanced score cards. Company X uses an online version of it as an initial round of evaluation, to reduce large sets of ideas from campaigns to a manageable size, and more traditional balanced score cards in their second reduction round. Relatedly, Swisslog weight their criteria according to must-haves, nice-to-haves and not relevant, as advocated by Cooper (1988).

A method not mentioned in literature or by experts is SCA's tip to use open innovation. A good half of the projects that are radical at the firm are done through open innovation. The firm buys and looks at semi-manufactures from the external environment, where they have come quite far so that they know what they can do, have done market research, and the like, but it is still new to SCA. This is used as decision support, to aid in estimations and comparisons. If specifics are needed in both marketing and

technology competencies, you can buy a small firm you have studied throughout the open innovation process, for example.

The case studies also showed that, as stated by literature, firms use a combination of methods combining the outcomes of experimentation, gaining management support, and including strategy. This is *exempli gratia* as advocated by Bessant *et al.* (2010) and Martinsou and Poskela (2011). As advocated by Rochford (1991) but otherwise not mentioned in the literature or by experts, Company Y and Swisslog save ideas to be used further on in the firm's life. What can be seen is that firms do align in some of their methods choices with the ones reviewed by Taherian (2011). All firms use criteria to some extent, and a business model, to make go/no-go decisions of some sort. The areas included in the Real-Win-Worth model are covered by the literature and used by firms in mentioned criteria, but not in the sense to answer the questions "Is it real?", "Can we win?", "Is it worth doing?" *per se*. Company Y for example uses a risk matrix, although it is adapted to be their own version, and the business model canvas and customer development process are used to anchor the idea in reality, and to iteratively build a business case. Neither case interviewees nor experts state that one should consider how the methods can be combined as they have different aims, as discussed by Taherian (2011). That is however likely to be of importance anyway, as *exempli gratia* interviewees were not asked about that specifically, and as the screening process seems to include several different activities.

5.3 Criteria

The expert interviews regarding the use of criteria revealed similarities and disparities between the interviewees as well as between the interviewees and the previously presented literature. All the interviewed experts have stated that criteria should be used in the FEI when screening radical ideas. Without the use of criteria, one might end up spending time and resources on ideas that might end up being wrong. This discussion relates to the presented theory, where Martinsou and Poskela (2011) advocated the use of criteria for FEI success. However, Hedvall, Bessant, Wockatz, Expert A and Gartner all argue that criteria used for screening in the early phases should not be too detailed but more provide a holistic set of questions. For instance, as previously mentioned, Hedvall emphasised that one cannot find the diamonds too early in the process, which makes it rather strange to put too much emphasis on trying to evaluate them. Similarly, Bessant argued that the questions should be rather straightforward in the early phases, needing only simple answers, whilst Expert A advocated rough assessment so that the idea can be developed further. These statements cohere with theory suggested by *exempli gratia* Cooper (1988) and Koen *et al.* (2001), who advocate that the screening process should be a culling activity, where the harshness level of criteria increases as the screening process proceeds. This further relates to Boerrdich (2004) and Gaubinger and Rabl (2014) who also emphasise the importance of low formality in the FEI to allow for creative idea loops. Exactly how one should increase this harshness is however not presented in either theory or by the experts. Some of the interviewed representatives from the different companies agreed to the fact that criteria should not be too detailed in the early phases. Alfa Laval, AstraZeneca and Hype spoke about it, where for example Hype said that it is about that the level of knowledge is built up throughout the process where the level of detail, data and facts increase as the screening proceeds. Other companies, such as Company X, did not explicitly say that criteria should not be too detailed, but rather pointed to the use of key areas in the early phases and not a set of specific criteria. Hype and Alfa Laval also argued that different ideas should have different

criteria. Alfa Laval explained that different ideas need different types of discussions and different levels of attention, by which a specific set of criteria would not do the ideas justice. This coheres with Martinsou and Poskela (2011) who argued that different criteria are associated with varying strategic opportunities.

As it has been shown, all experts and company representatives who have elaborated on the issue of increased harshness level, agree on the issue that the criteria should be simple in the early stages. This seems to be correct, as also the process is to be a culling activity, as ideas will change and grow through the process, and the process hence cannot be too harsh in the beginning. Criteria are a part of the process, and should hence probably follow the same reasoning as the process through time. This implies that the to be discussed process for screening in large firms should not have a specific set of criteria but rather a specific set of key areas to look into in the earliest phase of the screening process. Furthermore, the analysis above has implied the importance for a large company like Volvo to understand that ideas develop through a screening process, whereby ideas at the earliest stages might not seem to be diamonds, like Hedvall called it. The screening needs to allow for the ideas to grow as well as let the screeners' knowledge regarding the idea grow.

Showstoppers and thresholds

The interviews with the experts revealed that many of them look for information, or ask questions in the same general areas to a very high extent. Related to Cooper's (1988) discussion regarding 'must' criteria is the argument provided by Hedvall regarding the identification of showstoppers. Whilst Cooper (1988) referred to must criteria in the sense that ideas must have specific attributes for it to move along, Hedvall referred to showstoppers in the sense that one should early look for attributes that the idea cannot have, i.e. hinders such as too expensive technology or too small market potentials. This discussion is similar to the discussion with Gartner, who advocated the use of thresholds, which suggests the use of one or two absolute criteria. Ideas that do not pass these certain absolute criteria would not be pursued. Only one company mentioned the use of showstoppers, and that was Alfa Laval. It was explained by the interviewee to be the first thing his team needs to look into in the screening and that finding the showstoppers early counters them from spending a lot of resources on unnecessary activities. Hype on the other hand mentioned the use of thresholds, similar to what Gartner said.

Although the term showstoppers and thresholds have not been too widely brought up in the expert interviews or in the multiple-case study, it can still be argued that it provides valuable insights. Thresholds have been identified by the researchers to be more suitable when screening ideas for incremental innovation, since thresholds usually are specific in their nature, and radical innovations are very uncertain. Firm representatives explained that assessments for answering criteria are very rough and uncertain. Hence, specific thresholds seem to be too much related to NPD and incremental innovations. Therefore, the use of thresholds will not be further analysed or discussed. However, identifying showstoppers seem doable and very related to screening ideas for innovations new to the firm, and could act as one of the few early key areas to look into. Not only does it seem doable, but would also mitigate companies from spending resources on ideas that will be terminated later on because of a hinder that could be identified early on. Hence, it could be argued that showstoppers could be used by large firms, such as Volvo, in the earliest stage of the screening in the front-end.

When looking at specific criteria to use when screening in the FEI, there are similarities and disparities between experts as well as between experts and literature. Similar to the literature, a few general areas have been identified from the expert interviews. These are the areas of *market, technological feasibility, strategy and vision, risk, financial assessment, soft sides, environmental analysis, time, newness level,* and the use of a *business model canvas.* This cohered with the areas that have been identified from the multiple-case study, only adding the area *regulations.*

Market

Wockatz, Bessant, Expert A and Hedvall all emphasised the importance of assessing whether the idea is solving an existing customer problem, want or need. They all highlighted the necessity of starting with desirability, where Bessant stressed that there is no use in trying to develop technologies that are unwanted. Expert A and Wockatz advocated the need to find the true problem, since many customers often are not aware of what they want. This reasoning is very much related to both the presented FEI literature and entrepreneurial literature, however with disparities. From the FEI literature, Cooper (1988) argued that customer interactions are to be done in what he called stage three, *Concept definition,* whilst Koen *et al.* (2001), Rochford (1991) and Boeddrich (2004) advocated that customer interactions should be introduced earlier. Langerak *et al.* (2004) and Reid and de Brentani (2012) further advocate the need to anchor the screening in the market orientation and vision, hence highlighting the importance of customer feedback. Similarly, but to an even higher extent, the entrepreneurship literature, suggested by inter alia Sull (2004), Blank and Dorf (2012) and Ries (2011), highlighted the importance of starting with customers and the need to include customer feedback in the very start. Related to this discussion are the experts' views on market potential or opportunity, where Bessant, Expert A and Hedvall pointed to the necessity of looking into these areas in the first screening. Both Hedvall and Expert A further addressed the need to look at whether the idea has potential to become really large, i.e. generate several billion dollars. This train of thought clearly implies the importance of looking in to the desirability both early in the screening, as well as throughout. Even though Cooper (1988) advocates to include customer interaction in phase 3, it seems to be that this should be done in earlier stages to ensure that customer feedback is taken into consideration, which is highlighted by many, more recent sources. The earlier customer feedback is included, the less money will probably have to be spent to revise the concept later on. This research does not regard disruptive, but new-to-the-firm, radicalness level of innovation ideas, which adds to the relevance of locating a customer problem to solve, rather than create one that does not exist.

Similar to both the expert discussions, the FEI literature and the entrepreneurial literature, all interviewed companies stated that it is important to look into customer value(s), problem(s) or need(s). Alfa Laval, similarly to Bessant, emphasised the importance of not only working with the technology side but to always include the market side, since there is no use developing something that no one wants. AstraZeneca described that they put focus on disease segments and the true customer problems, rather than a direct product. Swisslog and Hype both mentioned the term desirability to be important in the early phases, where Swisslog argued that desirability has to come first and that one should kill the idea if it is not desirable. AstraZeneca also mentioned that they do market value estimation, whereas Hype mentioned that firms look, and should look, at market attractiveness in the early phases. Furthermore,

some of the experts and companies pointed to the need of looking at the market opportunity, and the need to roughly try to estimate the market value and if the idea has potential to become really large. This could be argued to be suitable for a large company like Volvo, where ideas that are going to be invested in need have some sort of big potential. Therefore, a rough market value estimation could be included in the early phase of the screening in large firms like Volvo, much like trying to identify showstoppers. However, as firms have pointed out that this is very hard to estimate in these early phases, it should not call yes/no decisions if the market is not obviously very limited.

External environment

Wocktatz, Bessant and Hedvall include looking into the competitive situation to avoid spending resources and time on things that have already been done elsewhere, or to identify a possibility to differentiate themselves, or a gap. Moreover, Wockatz addressed looking into the environmental situation, where the company itself, the transactional environment and the non-transactional environment need be assessed in order to avoid operating in vacuum. Companies need to know what is going on around them. Arguments provided by Hedvall support this claim, where Hedvall believes that the external environment is of very high importance, stating that one cannot have a narrow focus when dealing with idea evaluation. One has to know and understand the outside world. This is supported in the FEI literature, where Cooper (1988) argues that companies need to have an understanding of what their competitors are doing, whereas Koen *et al.* (2001) argue that external factors, not only existing competition, need be included in the screening. All the companies but Company X argued that the competitive situation need be included in the screening. AstraZeneca was the only company to mention the use of foresight, trends and guest speakers as important input in the criteria for screening, and said that it will make a huge difference if a competitor will launch a drug three years ahead of them. Hype stated that looking into the competitive situation is something that he would like to see more of in company practises, since most companies do not use it. According to Hype, companies are supposedly afraid that it will make them follow their competitors. However, the other companies did not further highlight looking into other external factors.

Since both literature and the empirical findings have shown that the competitive situation should be included in the screening, it implies the necessity for large firms like Volvo to include it in their screening process. Although the empirical findings and the presented literature have not brought up the importance of having an understanding of the outside world to a high extent, the researchers would argue that it is important in large firms. Applying it to Volvo's context further implies the necessity and importance to have this understanding in the screening, since it is a highly technology driven company where it can take many years to develop a product. Having *exempli gratia* foresight and trend insights could help them direct their development in a specific direction or help them redirect from a wrong direction, without having to wait until the product has been fully developed. Thus, the screening process should not only involve looking into the competitive situation, but include an overall environmental situation, both current and future.

Technological feasibility

Much like the presented literature, experts argued that technological feasibility needs to be addressed in the criteria, to be able to understand if the idea is doable or not. Wockatz and Expert A pointed to the technological feasibility regarding the idea itself, whilst Bessant pointed to technological feasibility in the sense of internal technical competencies. The majority of the different authors support both these arguments in the literature. This relates to what has been seen in the multiple-case study, where all six companies argued that an assessment of technological feasibility need be included in the early phases. For example, Alfa Laval claimed that early on they only do a small assessment of how difficult it might be to do, similarly to Company Y who have 'technology difficulty' as one of their early criterion. Moreover, an idea's newness level, or level of disruption, was also mentioned to be an important criterion to use according to Gartner, which was also supported by literature by for example Hart *et al.* (2003) and Reitzschel *et al.* (2010). Two companies from the multiple-case study, Company X and SCA, also pointed to the use of uniqueness as a criterion in the screening. Therefore, it seems logical to include an assessment of technological feasibility when designing the screening for a large firm like Volvo. The firm does not need to be able to do everything themselves, but it can be positive to understand what will be required by the firm, and what help that will be needed. To not regard the feasibility of the idea in a large firm like Volvo, which is based on technology, seems very risky.

Financial assessment

Financial assessment was also declared to be an important criterion according to Hedvall, Wockatz, Gartner and Bessant. For example, Wockatz argued that viability, i.e. making money, would be the last thing to look at when screening, stating that desirability and technological feasibility are more important. Hedvall claimed that it is important to look at parameter such as cost, level of value an idea can create, however also pointed to that these are only rough estimations, and more a way of verifying that there are no obvious hinders. Similarly, Bessant mentioned straightforward questions regarding increase of revenue and market share, and also pointed to the need of keeping it simple. Similarly, entrepreneurial literature suggest that revenue streams is an important aspect to include early in the customer development process, but is however not priority. Furthermore, both Koen *et al.* (2001) and Cooper (1988) include a financial assessment in the screening. Company representatives in the multiple-case study all discussed financial assessment to some extent. According to AstraZeneca it is difficult in the beginning, but they want to know whether an idea is financially good for the company. Alfa Laval includes a small assessment of how valuable an opportunity is to them in the earliest phases. Company X explained the financial assessment to include potential cost, the resources needed, potential business impact. Like the other companies, Company Y mentioned economic potential, but however argued that it is difficult to assess if you have not done something similar before. Even though desirability and feasibility is arguably most important to investigate in the earliest phases of the screening process, it seems unlikely that a large, global firm like Volvo should not include a financial assessment until the very end of the screening process. It is important to contextualise the process to be presented, where the bureaucracy of a large firm probably will require some sort of financial assessment before checkpoint 3. However, these ought to be very rough, and seen as indicators rather than facts. It can be advocated that the market potential analysed above is enough in these early phases.

Strategy

Strategy, and strategic fit, are areas that have been widely discussed in both literature and in the expert interviews, where Bessant, Gartner, Expert A, Elerud-Tryde and Brasta spoke about strategy in different senses. Brasta argued that not everything a company does should be aligned with the current strategy and its objectives, but rather also have 50% of the business cannibalising on today's ways of working, thereby being contrary to the strategic goals. Bessant discussed strategy in the sense that if there is a clear strategy, one will have a fairly strong set of criteria, thereby pointing to that the criteria will be very much driven by strategy. Bessant further suggested that strategic fit is of high importance and a way to decide whether to pursue an idea or not, claiming that the absence of strategic fit will divert companies from doing things they want to do. When Expert A was asked about his thoughts of including strategy and vision as a part of criteria, he explained that it would beneficial to do so when trying to decide whether the idea fits in the company or if someone else, for example an employee, should pursue it on their own. Gartner argued that strategic fit often comes in very explicitly as criteria in the scope phase, when for example setting up innovation jams, acting as a background for setting up themes. Similarly, the literature presented the use of strategy in the screening from different perspectives. Some authors argued that one should have an explicit innovation strategy, for example Gaubinger and Rabl (2014), whilst others, such as Koen *et al.* (2001) argued that it should be included in the overall company strategy. However, strategy was in some sense mentioned by the majority of the authors with regards to criteria for screening.

Strategy was also widely discussed in the multiple-case study, where all companies highlighted the use of strategy in different senses, similarly to the disparities between the experts. Alfa Laval's, SCA's and Company X's views on strategy concurred with Bessant's, stating that opportunities or ideas need be aligned with the company strategy to pursue it, i.e. they look for strategic fit when screening. Company Y further mentioned that ideas that do not align with company strategy could be managed through acquisitions of companies with already experimental brands and strategies. Swisslog and AstraZeneca on the other hand spoke of strategy similarly to Gartner, saying that strategy can be used to set key areas in which the ideas need be included to gain attention. AstraZeneca explained that they have chosen to prioritise five areas, based on strategy and vision, so all the ideas that are chosen come from these five areas. Ideas outside these areas have a very hard time to get attention in the company. Similarly, Alfa Laval explained that the board sometimes give them restrictions regarding certain product categories. Ideas that come in outside of these areas usually have a tough time to survive in the company. The inclusion of strategy and/or vision in the screening process seems to also be a good outcome for a large company like Volvo. This as the process to be presented is focused on ideas that are new-to-the-firm, and not new to the world. At that level of newness, a strategic alignment to some extent, even though if only to the long-term vision, seems appropriate. However, as the process does regard potential radical innovations, it can also be argued that there will be great opportunities that lie outside the firm's current train of thought. That also relates to Burgleman (1983), stating that firms can let new ideas direct their future strategy, which calls for an interesting discussion. Due to this, it can be argued that strategic fit in this sense should not mean an exact alignment, but rather that it is related at all to the industry and long-term plans the firm has. Some sort of alignment will create a coherency in the firm, which probably is very important in a firm of such size.

Soft issues

A disparity between the expert interviews regarded views on softer issues, such as whether to include an assessment of personality traits in the screening. Hedvall, Wockatz and Expert A all brought up the subject of looking at the person who is going to pursue the idea. This analysed further below, under the heading *Stakeholders.* One should here note that all these three experts come from the field of entrepreneurship and venture capitalism, contrary to the rest of the interviewed experts. Their arguments cohere with entrepreneurial literature, which puts much stronger emphasis on the team's and the entrepreneurs' characteristics in criteria for evaluation than the FEI literature does. None of the six interviewed companies mentioned softer issues such as personality traits or team characteristics as a part of their criteria

Risk, time and regulations

Like many authors suggested in the literature, Wockatz, Brasta, Gartner and Bessant mentioned that risk is important to include as a criterion in the screening. Brasta and Bessant spoke of risk as a parameter or criteria in the portfolio thinking, whilst Wockatz mentioned typical risks that VCs look at (technology risk, market risk and entrepreneurial risk) and Ron Adler's innovation lenses (execution risk, adoption risk and co-innovation risk). Risk was mentioned by Company Y and AstraZeneca as important input in their criteria. Company Y explained that they look into and calculate market and technology risk in different ways, whilst AstraZeneca includes risk as a part of their portfolio management, where they have some safe bets and some more risky ones. Furthermore, time is another important criterion to take into account according Brasta, Hedvall and Gartner. This has also been suggested in the literature, as well in the interviews with AstraZeneca and Swisslog, and seems indeed to be something that large companies like Volvo should consider. However, it should be emphasised that the traditional risk management focus of incremental innovation and NPD projects will not be viable to use.

As already mentioned above, regulation was one area that some of the companies pointed to that none of the experts brought up. For example, AstraZeneca explained that due to the strong regulations in the industry, their criteria need to include those of all regulatory bodies overlooking pharmaceuticals. This relates to Alfa Laval, who expressed that if they have very radical ideas, they need to involve authorities. Hype further argued that one should not forget to look at regulations. The previously presented literature did however not explicitly state that regulations need be included, but Sull (2004) argued that screeners need an understanding of regulatory factors, amongst other factors. Even though not mentioned by experts, and hardly so in the literature, it appears to be of importance to consider regulations quite early in the screening process to be presented for large firms such as Volvo. This, as they can act as clear showstoppers that can put an end to an innovation project, regardless of its potential for the firm and its desirability.

5.4 Stakeholders

"You can see the whole front-end phase as being constituted of several persons and stakeholders, and their interactions and motivations. Generation and evaluation of ideas are not really a point in time. An idea is rather floating and continuously changing. It will be communicated differently depending to whom you speak to, so you have to take into consideration who the persons involved in making the

decisions are, and how they need to be communicated to differently. " – (Elerud-Tryde, 2014, pers.comm., March 21st).

Idea Generator

Brasta, Hedvall, Expert A and Wockatz discuss the inclusion of idea generators in the screening and development process, with varying rationales behind the statements. Brasta mentions showcasing and communicating successful examples where the idea carrier has been given the chance to develop the idea, as a way to motivate employees to be innovative and submit ideas. Hedvall and Expert A further stated that from a know-how point of view, separating an idea carrier from the idea itself can be problematic in the beginning, but that this idea generator will need complementary knowledge from others. Expert A said further that including the idea generator helps in simulating the VC process in large firms, where the entrepreneur has total responsibility with continuous reviews of progress. He states that even in a large firm, you need to include the person if (s)he is the right type. Such a person should be the project manager, and choose the team to work with, which can be double checked so that no knowledge needed within the firm is missing. A problem with transferring ideas, through *exempli gratia* switching screening team, is that a lot about ideas are within people carrying it: it may not be able to codify on paper and transfer for a while. The discussion of idea generator inclusion in the screening process is not explicitly discussed in reviewed literature, but it however seems to be of importance, as it can have several consequences for the process' quality.

In contrast, the entrepreneurial literature states that some persons who are extremely sensitive to identifying problems or possibilities might not be good for generating solutions to them. Brasta also pointed out that people should not have to develop the idea if they do not want to, whilst Wockatz stated the idea generator and the idea vessel do necessarily not have to be the same person. Ideas should also be evaluated on the basis of what is going to happen next. In a large firm, he stated that you need to manage business unit inclusion early, to avoid the 'not invented here' resistance. Further, idea generators need not be included throughout the whole process according to Wockatz, because they might actually have been able to communicate their idea in a way that does not need them to be involved moving forward. Hence, there seems to be the need for a balance to be struck between full inclusion and some, to mitigate these risks.

Several firms provide the idea generator the chance of being part of the evaluation team. Alfa Laval, AstraZeneca, Company X and Company Y all sometimes include the idea generator. However, Alfa Laval mentioned that it depends on whether it is the right type of person – just like Expert A. A seller can for example not develop the technical solution, but be included to not loose the original idea, which relates to Expert A and Hedvall's statements of the risk of losing know-how. Company X explained that it helps the idea to move along in the business, and Company Y initially include them in the team. However, Hype agrees with Brasta that it should not be necessary, so people with good ideas are not put off, and Company X mentions it is a choice to be included rather than a must. Swisslog similarly explains that the process needs to let all people play: the insecure, the shy, and the passionate. Company Y highlights that the inclusion works like a reward, which relates to Expert A's and Hedvall's discussion of incentives, as well as Brasta's. Swisslog however states that it does not offer any monetary incentives for successful idea generation, and that he has never been asked about it except from management. However, none

of the interviewed companies do always include the idea generator. It does seem like motivation and the risk of losing sight of the original idea in the earliest phases are the practical issues firms deal with within this area. The fact that all firms work with idea carrier inclusion in somehow, and state it to be positive, in combination with that experts think it is of importance to consider, highlights a gap in the FEI literature. This subject also relates to the methods of Dragon's Den and Hackathon, where teams are allowed to develop ideas. However, it seems like the firms do not include all idea generators, throughout the whole process, which seems unrealistic for a large firm like Volvo to be able to do, as they then have a lot of work hours to replace.

Elerud-Tryde adds the dimension of whether the evaluators feel comfortable in presenting the ideas to the higher management. Also, the evaluation process depends on what the involved persons have to gain or lose from the evaluated idea being implemented. This relates to the entrepreneurial theory (see Zara, 2008) emphasising that it is important that the employee's skills in identifying, framing, positioning and selling their ideas to others, in particular senior managers, are developed.

The entrepreneur

Regarding entrepreneurs in start-ups, Hedvall and Expert A emphasised positive traits to look for. This is of interest here to complement knowledge of how to build firms' development teams, or what to look for in an idea generator that will possibly be included in the team.

> *"It is better to have a B idea with an A man, than an A idea with a B man"* – (Expert A, 2014, pers.comm., April 10th)

Hedvall looks for a person that is motivated, and that values the commercial work at least as much as the technical development, which seems appropriate since the screening often speaks of ideas' market and technology sides. Further, he emphasise they need to know and understand their external world and environment, which relates to Ardichvili *et al.'s* (2003) statement of that entrepreneurs are great at reacting to external behaviour. It also relates to Zahra (2008), stating that employees in firms need be able to, and educated in, recognising opportunities, trends, and seemingly unrelated matters in the external environment. Expert A looks for a curiosity, and that the person has a great drive to pull her- or himself up when things go wrong – because you will fail throughout the process. Wockatz similarly emphasise that, when he does let idea generators be involved in the process, he looks for intrinsic motivation, as it makes people work hard with the idea and mitigates quick exits. Literature also emphasised the importance of intrinsic motivation, where a goal commitment and attitudes is of great importance (*exempli gratia* Martinsou and Poskela, 2009: Steven and Burley, 2003). Hence, there seems to be a coherency between all sources of data, stating that the motivation and drive of entrepreneurs is important to consider due to the nature of the work. Thereby, it also seems to be clearly related to the team and/or individual idea generators that are to work with the proposed screening process in large companies like Volvo.

The team formation

Expert A emphasised that evaluators in firms need to be intelligent, prepared for failure and change, and able to listen to, and develop ideas based on feedback from the market. Further, they should be enthusiastic and curious, but also be able to back off so their own curiosity and enthusiasm does not carry them away. This is similar to the FEI literature emphasising the need for screening teams to tolerate high risk, be creative and open to the irrational process. Expert A states that evaluators could for example work like VCs, where one checks mega-trends and the like to know what is relevant, do evaluation and progress checks, and provides money. However, the ones evaluating should not drive all the projects, and especially not without the idea carrier. This discussion is similar to that of entrepreneur traits discussed by Wockatz, Expert A and Hedvall above, which links the two chapters. Whether the evaluators and developers should be the same team is not stated in the literature. However, the FEI literature also emphasises that evaluators in firms need to be able to handle uncertainty and irrational processes (Stevens and Burley, 2003). Bessant adds an additional trait, where he said it is helpful to have someone who is prepared to challenge and provide a different perspective. Not with an interest in the project, but who looks at the portfolio and question whether the firm is being adventurous enough, or too much so. This relates to the discussion of portfolio perspective presented in the chapter. Such external checks of the team can be helpful according to Bessant, as there is much emotion involved in the process: a perspective not mentioned in reviewed literature. These kinds of external checks are probably helpful, even though not emphasised in literature, as they facilitate the VC way of working, but also as the screening process for radical innovation seems to be dependent on people, and their skills and feelings to an extent. Hence, an external check can be of relevance to bring fresh perspective to the work. Further, most of the presented traits appear to be based on that evaluators, alike entrepreneurs, need to be able to handle and thrive in the uncertain and challenging nature that radical innovation work will bring. However, interestingly, the traits of handling uncertainty and being creative were not explicitly stated by the firm representatives. The firm representatives spoke of experience and knowledge required, as explained further down, when asked about what is needed within a screening team. However, several firms emphasised the need to iterate and that the process is uncertain, whereby it still appears to be relevant to discuss in relation to the process that is to be presented for large firms such as Volvo. Further, answers regarding these areas may have been hindered, as the interviewees were the team members and it may be non-intuitive to come to think of ones own personality traits when discussing innovation management.

Knowledge, experience, and stakeholder inclusion

Several experts discussed inclusion of varying knowledge in evaluation of different ideas, where Expert A states that the same team cannot evaluate every single idea, as new knowledge will be required. As mentioned, Brasta discussed to include higher management for each area, such as finance and IT, in the last evaluation. Further, Wockatz preferably involves experts in the screening process, and Bessant also advocated that firms ought to invite relevant experts to aid in project judgement. But, he also states that a risk with having different people every time is that continuity is lost. Further, he explained that crowdsourcing can provide the wisdom of the crowds, which mitigates the risk of a too small group being a little idiosyncratic. In the reviewed literature, a gap was identified, where literature does not discuss the differences in team configurations between evaluations, which will be addressed below.

Additionally, Brasta highlights that the evaluating team needs to somewhere include people of certain rank that can assure a budget and resources to the project.

Alfa Laval, AstraZeneca, SCA, Company X and Swisslog all have designated teams that screen and develop radical innovations. At Alfa Laval, it is the same four people that screen radical ideas, at SCA, the same core team works with radical ideas, and at AstraZeneca, one team works with the earlier phases and one with the latter. Within its seventeen business functions, Swisslog also has two educated idea reviewers within each function. However, several experts discussed the inclusion of varying knowledge within teams, and for example Expert A stated that the exact same team cannot evaluate every idea. This is a theme also discussed by firms. AstraZeneca, Company X, and SCA, bring experts into the teams to complement the knowledge. AstraZeneca uses it throughout an evaluation process, whereas Company X includes them early and also collaborates with other innovation teams within the firms informally, and Company Y includes them when needed. Hype also highlights the importance for firms to do so, and for evaluators to have idea specific knowledge. Hence, it appears to be a unity in that the same team(s) work with potential radical innovation screening in large firms, but that their competencies and knowledge will need to be complemented in various projects, by *exempli gratia* experts. This seems suitable for large companies like Volvo as well, as the analysis has emphasised the differences in uncertainties between idea types. And, as experience seems to be of importance, it is intuitive to have core team(s) working with radical idea screening so that they can also gain experience from these practises. As Volvo already have the former Innovation and Planning team working with this, it seems suitable and positive to keep this setup for the firm for the new process as well. It can also become very time consuming to locate and re-schedule suitable team members for each idea for a large firm like Volvo.

Hedvall mentioned that evaluators should be experienced with the thought market and/or applications, whereby large firms should not let only junior workers evaluate and more senior workers need to look at the business case. Similarly, Sull (2004) highlights the importance of industrial experience. Gartner similarly explained that skills for innovations with high novelty to a large extent are based on experience. A distinct skill needed in the group is a balancing act between exciting opportunities and business relevance. That is similar to Expert A's statements that entrepreneurs need be able to manage their curiosity, even though it is needed. This is in line with entrepreneurial literature, where exempli gratia Ardichvili *et al.* (2003) explain that each person's prior knowledge will affect what opportunities people recognise and realise, and identified applications underemployed resources. Bessant also emphasised this, where he said that the evaluating team needs to include an accumulation of knowledge. Hence, it seems like Volvo need to take this into consideration.

Hedvall, Bessant, and Expert A emphasise the importance of that both the technology and the market sides are represented when evaluating ideas. The reviewed literature all takes the standpoint of market and technology being the two main areas, from which opportunities for radical ideas can arise. Hedvall states that the two sides need mutual respect between the different sides of knowledge, and Bessant emphasised that both areas need be presented by people who want to learn by doing. Apart from technical and market knowledge, Hedvall said it is good to include someone who represents the idea in its implementation and application, Bessant said that they need to represent a number of key

perspectives, and Wockatz explicitly stated that cross-functional knowledge is preferable. The literature also recommends that firms should think of having cross-functional teams (Koen *et al.,* 2001, Martinsou and Poskela, 2009), and that people with opposing opinions should be included to foster radical ideas (Martinsou and Poskela, 2009). Related to Hedvall's latter statement, Wockatz also spoke of including business units and information of their desirability for the idea, to *exempli gratia* avoid the "*not invented here resistance".* Even though the idea is valuable for the end-customers, the business unit is the next step in a firm. This is related to Gartner's statement that many innovation functions have to make other part of the company care about the project, and spin the idea to do so. Further, Gartner stated explicitly that if the ideas concern specific business units, such as manufacturing, supply chains etc., the business owners should ideally have a large saying in which ideas will be selected. Brasta also said that he pictured representatives from different business units' management to make the final evaluation. The literature however does not discuss business units as part of internal stakeholder management. Nevertheless, as it is mentioned by several experts also having experience with innovation work in Volvo, it seems to be of direct relevance to regard when designing the firm's process. Additionally, business units have strong similarities with customers, and can therefore be viewed as internal customers, since they should take over the business concept in either developing it through an NPD process, perhaps use it when it is finished, or be in contact with customers who use it. As all sources of data have emphasised the vast importance of customer inclusion, it seems to be relevant to think of business unit inclusion as well in the process. Hence, it is rather an area missing in the reviewed literature.

Related to the reasoning about business unit inclusion, the team should include and think of stakeholder engagement, and not only focus on the customer, according to Wockatz. This is shown in the literature review to be mentioned in the FEI literature, but emphasised more in entrepreneurial literature, through *exempli gratia* Steve Blank's customer development process (see Blank and Dorf, 2012). Moreover, as previously mentioned, Hedvall discussed the importance of people knowing their outside world to connect the dots, which relates to Koen *et al.'s* (2001) screening model where the outside world affects the process. Further, the entrepreneurial literature does to a greater extent emphasise entrepreneurs' capability to exploit unnoticed opportunities, react to external behaviour, and having knowledge not available to everyone (Ardichveli, 2003: Veeraraghavan, 2009), which is an addition to the FEI field as discussed in chapter 2.

Alfa Laval explains its team to be composed by four people with different backgrounds and experiences, where two are structured and two unstructured. It is an important balance that complements each other, relating to the literature emphasising that radical innovation teams should have opposing opinions present. However, contrary to the expert comments, Alfa Laval has not got marketing represented in the team throughout. The interviewee does however think screeners must have an interest for and ability to understand customer value. In line with statements of Bessant and Wockatz, SCA, and AstraZeneca have cross-functional teams evaluating radical ideas. Hype also states that firms gain from including people from *exempli gratia* marketing, sales, quality and operations, and Swisslog explained that they would like to include regions and customer services people in their screening process, to balance the current focus on feasibility. This is in line with Bessant, Hedvall and Expert A stating that both marketing and technology should be represented in teams. Hence, it seems like firms

are not representing the marketing side when working with radical idea management as much as literature and experts emphasise that they should. This seems to be an area where the studied firms can improve, rather than highlighting that the literature and experts are wrong, due to the strong emphasis put on customer focus from all sources of data.

Several firms also include different business units in the process, as advocated by Brasta and Wockatz. Alfa Laval tries to involve business segments with regular meetings, Swisslog involves business units related to the idea in the evaluation, and Company X starts to early speak to business units to locate desirability and a place where ideas can be incubated. AstraZeneca uses information from other business units, such as those providing competitive analysis and foresight. That discussion of where to gain relevant information is not discussed in the literature. Relatedly, Alfa Laval explains the importance of including end customers in the process, and to find the right ones to speak to. This relates to the discussions of the customer development and lean start-up processes. Company Y also tries to identify and include lead customers.

Lastly, Hype made a comment that evaluating teams should not have too much interest in the outcome, which can be related to the above discussions of motivations. Otherwise, he has seen teams skipping criteria or evaluators feeling threatened. This also relates to Gartner's statement that the team need to balance the excitements with looking for relevant business value, and others' discussion of motivation. Further, Hype said that the team needs to be trusted by the sponsor for the project to have a future. He also emphasised that for ideas of high newness levels, the team evaluating need to have an entrepreneurial mind-set and work outside the everyday processes.

Champions

Literature, experts and firms all discussed the drive and importance of radical idea champions in large firms. It was mentioned by Hedvall, as someone needs to push projects through. Gartner however stated that the innovation function usually does not have the authority and resources to create and develop every idea themselves, whereby they need to be able to influence across the business. Gartner moreover explained that innovation functions often have to make other parts of the company care about the project, and spin the idea to do so. They also state that it is the innovation leader's task to understand how that is done in the specific firm. Hedvall thought it to be preferable that the screening process is structured around those that champions and driving the idea, and then do obstacle course and checkpoints on them along the way. This is very similar to Expert A's statement that people need be given the freedom to access customers and information, and not be hindered by bureaucracy. The study by Bessant *et al.* (2010) also showed that inclusion of champions is important to recognise in firms, and companies successful at innovations ensure champion inclusion in various ways for projects with high innovation uncertainty. Such methods were also discussed by experts, but are presented in the 'Methods' section of this chapter. However, based on this paragraph, for firms with set processes, it seems like the dependency on employees champion the idea would decrease. At Volvo, the team working with radical idea screening appears to be champions, informally knowing other champions. Hence, if the process is built around their work, and them being assigned a budget or able to influence through continuous high management involvement, the process will to some extent include champions.

Management

Some of the experts, for example Gartner and Wockatz, pointed out that different types of inputs would have different types of screening processes, and thereby also require different types of management support. For example, Gartner expressed that depending on the type of innovation initiatives; different groups should be involved in prioritising the ideas. If the ideas concern a specific business unit, such as manufacturing, the business owners should ideally have a large saying in which ideas will be selected. Contrary, if it is more open-ended, not matching existing business areas so well, the prioritisation of the ideas should be done in a more central governance function or corporate function. Hence, it seems like more radical concepts would require more central governance. Wockatz highlighted that depending on whether one uses top down or bottom up processes for innovation, the support needed will be different, where in some cases one will need the CEO to point with the whole hand for things to happen. This relates to theory by Nobelius and Trygg (2002), who stated that there is no single FEI model for a company, but that it is adaptable and flexible.

The different experts all talked about the inclusion of higher management in different senses. Brasta, Bessant and Wockatz mentioned high management related to decision-making. Brasta spoke about high management in the sense that different business units' high management should be involved in prioritising ideas related to their areas, but how these ideas need be very well developed at this stage, including both a concrete business case as well as more exciting and selling story. Moreover, he also mentioned that it is important to have strong leaders that can point towards a long-term transformation of the firm, rather than to focus on short-term parameters such as price. Furthermore, Bessant highlighted the need to keep senior managers well aware throughout the process, since they have the resources and they need to be able to justify how they use their resources. Bessant however added that a team constituted of only senior managers risk being too small and does not take expert insights into account. These statements provided by Bessant and Brasta cohere with the presented literature, where for example Bessant *et al.* (2010), Cooper (2011) and Leifer *et al.* (2001) all argue that higher management support is needed for success in the FEI. Additionally, Hoegl and Parboteeah (2006) argue that higher management should allow for participative decision-making. This means that higher management should include their workers in the decision-making, since it would increase team goal commitment and thereby also increase the team performance, i.e. efficiency and effectiveness in highly innovative projects. However, Wockatz argued that instead of putting explicit emphasis on senior management support, one should look for people with decision-right, which are not necessarily senior managers. Here Wockatz highlighted the need to include people with influence, who can either spend their own budget or influence the right people or right business unit to spend their budget. Wockatz referred to the use of champions, and pointed to that without them, the CEO would have to be involved in setting directions. Hence, it seems like one can conclude that senior management support is needed for motivation and perhaps expertise, as large firms like Volvo could practically allow for the core team to work with a budget. Furthermore, Expert A highlighted higher management's role through another perspective. He explained that a failure of an idea is not always because of the idea itself, but maybe because of the people in higher management. This was not further explained, but it implies the special importance of the higher management.

The studied companies involve higher management in different ways, where some companies have explicit support or involvement, whereas others have more of an informing relationship to some extent. This emphasises that management support should be included at large firms such as Volvo somehow as well. For example, the representative from Alfa Laval explained that his innovation team has regular meetings with top management, to inform them about a couple of concepts that are necessary for top management to know about. Additionally, higher management is involved through giving the innovation team restrictions regarding certain categories from which they want ideas. This is similar to AstraZeneca's corporate idea generation exercises, where higher management define the areas in which they want ideas. If the higher management teams at a large firm like Volvo should decide areas of interest, it can be discussed whether the results then will have high newness level. However, it can aid in assuring a strategic alignment. Company X on the other hand argued that higher management support should be formed in the way that a senior executive or a business leader should act as a sponsor, because it will gain a lot of momentum. This was based on that there would be a clear commitment to implementation and funding. Furthermore it was argued that these types of senior executives are important in large companies like Company X, whilst Wockatz relatedly spoke of the use of champions with influence rather than explicitly using senior management. However, Wockatz did emphasise that senior management often have inherent influence. Contrary to the above-mentioned companies was Swisslog, where the interviewee explained that higher management sometimes have worked in the industry for a long time and therefore risk being too narrow. Despite this, he argued that management support though is critical, because of budget and resources, and explained that the more developed the concept is, the higher the chance for senior management approval.

The need for management support is apparent, but whether it should be to gain momentum, resources, to motivate employees or to gain direction, seem to not be clear. These differences can be related back to that each process is firm specific, and so will the need, and reason behind that need, for senior management inclusion also be. It can though be concluded that for radical ideas to gain momentum in large firms like Volvo, senior management will need to support the process in some way: without a budget, time, and time to assess what ideas to drive to company forward, ideas cannot be developed. It also seems to be important for motivation. Similar to expert views, some of the interviewed companies indicated that higher management support could foster innovation culture and climate. AstraZeneca explained that their CEO is very present in the projects, which was expressed as very good for development. Swisslog explained that it is important to have an approach that gives everyone a chance to be involved if the want to, all people including the shy, the insecure and the passionate.

In some of the expert interviews, with Brasta, Bessant and Expert A, higher management or senior management support was discussed in the sense that it can foster the innovation culture and climate in the company. Brasta expressed that management can create an open culture, where the employees are allowed to spend for example a Friday afternoon to come up with ideas, causing a need for higher management to accept weird ideas. Similarly, Bessant argued that a lot in the screening process is affected by providing the invitation from the top, where higher management can create a safe structure for the employees. Here higher management needs to listen, show interest and show that they are willing to act on good ideas.

One thing that was discussed in the interviews with Hedvall and Expert A was the possibility for higher management to provide their employees with incentives for innovation work, which is highly related to fostering a climate. Expert A explained that higher management can provide incentives for the employees to continue the development of an idea, through large rewards at a successfully finished project rather than during the project through a higher salary. That way, higher management avoids the people who are merely motivated by money rather than intrinsically. Hedvall argued that instead of burning platforms like in the start-up world, he would like to see incentives that bring people out of their comfort zone. The only company that mentioned the use of incentives in that sense was Swisslog, who expressed that their company does not offer any incentives to the employees. However, the interviewee explained that employees, the idea generators, have never asked him about it. He further explained that they once offered an iPad, but that it was hard to tell if it made any difference.

In some of the interviews, the role of politics was discussed. Elerud-Tryde, Gartner and Wocktaz argued that there are subjective goals in the screening process. Elerud-Tryde argued that the evaluation process depends on what the involved people have to gain or lose related to the idea. Similarly, Gartner explained that when sometimes leveraging a governance committee, they will tend to focus on their own problems and how to solve them, rather than to focus on things that might make their lives a bit tough for a little while. However, Gartner expressed the use of portfolio management as a way of emphasising certain areas for innovations. The role of politics in the screening process has not been discussed in the presented literature. This shows a gap between the literature and the expert's views in the subject, where the presence of politics is very likely since the screening process is dependent on many stakeholders and individuals. However, as the FEI literature has not emphasised this side of the process, it is not surprising that there is a gap in the literature regarding politics for new-to-the-firm innovation screening processes.

Another area where there were similarities amongst the interviewed experts and companies regarded including higher management in innovation initiatives, through for example a Dragon's Den or Shark Tank, where employees can pitch ideas to them. These have been mentioned above, but not with the sense of providing senior management support. Hedvall, Gartner, Wockatz, Brasta and Expert A all spoke of this type of inclusion of higher management, where for example Expert A and Hedvall pointed at that large firms should try to simulate a start-up and VC process. Wockatz spoke of this types of events in the sense that he does not trust only experts when screening, but rather wants to create a process with many filters, finishing in a Dragon's Den alike event, including the use of crowd selection. Brasta, on the other hand, spoke of these types of events with regards to that it provides the culture and shows off support to the employees. The use of innovation events such as Dragon's Den relates to Bessant et al. (2010) who addressed the use of these kinds of events in the presented literature, stating that they are relatively widely used. They advocated that firms are increasingly combining senior managers with larger evaluation groups as idea juries for selection of discontinuous innovation. Bessant *et al.* (2012) further included presentation rounds and ordnance survey as other examples of how higher management can be included. The experts did not mention these. Additionally, Bessant *et al.* (2010) argued that one needs to develop organisational ambidexterity for discontinuous innovation, whereas Expert A spoke of the ambidextrous part stating that it needs be given a bit of protection.

Companies that gave input regarding innovation initiatives such as Dragon's Den were Company X, Hype and Swisslog. Company X did not explicitly name it Dragon's Den or Shark Tank, but the general structure was similar. This points out these types of events as a phenomenon from entrepreneurship, where special emphasis is on pitching and convincing. Company X explained their event to be the final round in their screening process, where a high number of ideas had been reduced to a lower number of ideas. These ideas were then going to be pitched at the event with internal senior executives that were interested in, or might invest in ideas. Similarly, Hype explained that a lot of companies have people pitching for a certain pot for radical innovation ideas. Here he also mentioned that the group that evaluates could be constituted of higher presidents, only assessing the best ideas that the community have voted for. The representative from Swisslog shared previous experiences from when he worked at Bombardier, and explicitly named their events as Dragon's Den and that it was an internal VC approach. According to him, it really worked, making people motivated and brought forward passionate people. Hype pointed out that the creator should not be the one pitching, as (s)he might not have the skills to pitch well, but rather leave it to the experts. Comparably, the representative from Swisslog mentioned that employees might not have the right skillset, but how they at Bombardier mitigated that by providing coaching to employees throughout their process of building a business case. This further relates to theory presented in the entrepreneurial literature, where Zahra (2008) argued that management needs to help develop and educate the employees' skills in identifying, framing, positioning and selling their ideas to others.

6 Discussion

"Stop chasing the *Front-End process" – Nobelius and Trygg (2002).*

This discussion chapter will follow the same structure as chapters 2, Literature Review, 4, Empirics, and 5, Analysis. It will use insights and knowledge gained from analysis related to SRQ1 and SRQ2 as a base to answer the research question, see below, and purpose. Findings and knowledge gained from the analysis will be related to the context of Volvo as a large firm. The chapter will present a discussion answering this research's purpose, i.e. how the screening process for potential radical innovation in the Volvo Group as a large firm can be organised. This will be done as following: The discussion will present areas to consider, the recommended structure for the organisation of the screening process, areas of criteria to use and where to use them in this process, methods suitable to each phase and type of means one want to achieve, and what stakeholders to regard throughout the process, as well as how. It will also explain the nature of the process, as it influences the set-up. Each sub-heading will present that specific area's contribution to a recommendation for how the screening process for radical innovation should be set up. The sub-chapters will hence together present and relate parts of the answer, that collectively answers the purpose, which will be combined in the report's conclusions.

RQ) When critically comparing and combining findings from SRQ1 and SRQ2 with reviewed literature, how can the process for idea screening of potential radical innovation in the FEI be organised for the Volvo Group?

SRQ1) What complementary knowledge can be gained from experts within the fields of Venture Capital, Entrepreneurship, and FEI regarding idea screening for potential radical innovations?

SRQ2) What does best practise look like today in large firms regarding idea screening for potential radical innovation in the FEI?

The process representation will be built up as the chapter progresses. Information and conclusions that are drawn under each heading in this chapter will be combined at the end of the chapter to one, holistic representation of the organisation of the screening process for potential radical innovations at Volvo. The result will represent a process for radical innovations at the 'new to the firm'-level. Hence, the discussion does not relate to ideas regarding innovation that has incremental, or a disruptive, nature.

6.1 Front-end idea screening for potential radical innovation in large firms

The areas that large firms like Volvo should consider when organising their screening process for potential radical innovation will together form a framework. Throughout the literature review, four main areas that firms should consider when designing and using a screening process for radical innovation in large firms were identified. These hence represent the overarching areas that answer the research's RQ. To start at a broad level, one of the key contributions of this research is that collected understanding of that these overarching areas are to be included and affect each other, whereby this research represent a different view of the screening process for radical ideas. That view is that the

screening process in fact can benefit from being represented as a framework relating all areas to one another. These areas are the *structure* of the process, what *methods* to use in the process, what *criteria* to use for evaluating ideas in varying parts of the process, and the *stakeholders* of the screening process. Hence, it has been identified that a linear process map on its own is not enough to consider when organising a screening process for – the other three areas both influence and are influenced by the process set-up. Therefore, to provide the holistic representation of the areas large firms should consider when organising their screening process for potential radical innovation – and hence address the gap that was identified in today's FEI screening literature – a framework relating the process' structure, methods, criteria and stakeholders will be built up during the discussion.

A holistic process combining and relating all the important areas needed to be presented, explaining what areas that are important for firms to consider, and how they affect each other, for a good outcome. The screening is a complex process for radical innovations, and the interaction between the identified areas needs to be considered for the end result to be practically feasible for firms. The whole process does in turn need to be related to the remaining firm, stakeholders and the external environment, rather than to be presented as operating in vacuum. Especially, there was a need to not only mention, but also really understand how strategy, stakeholder management, and human interactions should influence this set-up. Further, the research has broadened the FEI literature with understanding from entrepreneurship – a field contributing to many important insights – and showed how firms incorporate it in their screening work. The findings have also validated that the screening process for radical innovation ideas in large firms should lie outside the NPPD process, and not be designed similarly to a NPPD process. These additions and overall findings will work as the base for the below building-up of a representation of a process for the Volvo group.

Before the discussion moves to this research's four main areas of study – structure, methods, criteria, and stakeholders – it should be noted that this research has stressed four important findings influencing the set-up of a screening process that has not been adequately taken into consideration in previous literature. Firstly, each idea evaluated will not be the same idea throughout the screening process; ideas will be changed through the development. The screening process should hence be regarded as a *learning* process, rather than just a judgement process. The ideas will, and should, be changed, adapted, pivoted and developed based on continuous new information gathering from business intelligence, customer interactions, stakeholders and experimentation. Hence, the process needs to be designed with this development in mind. Rather than viewing the process purely as a culling activity as often emphasised, it is important for firms to understand the reason behind this. The screening process needs to develop ideas and generate new knowledge, for firms to at all be able to make a decision on whether this is a "good" idea or not, and hence it needs to be a culling activity. Secondly, strongly related to the former, is the fact that almost no idea is great in its earliest phases. Hence, the process should not look for the diamonds at the earliest phases, but let many through initially and cull the number as the process proceeds. Radical innovation ideas bring with them high uncertainty, as there is not much information available about their outcome, and market applications and technology development are not yet clear. Thereby, ideas for potential radical innovation will need time in the process to develop a bit before they can prove whether they are something the firm wants to progress with further or not. The stepwise building up of case by entrepreneurs, open to changes and pivoting, is hence something to

incorporate in large firms' processes, as it allows for the ideas to grow and prove their worth. That was also shown to be successfully done by firms today, and advocated by experts. Thirdly, stakeholders both influencing and influenced by the process needs stronger emphasis in the organisation of large firms screening process for potential radical ideas. This will be discussed further under chapter 6.1.4 Stakeholders below. And, fourthly, large firms like Volvo need to ground the development of the concept throughout the process in an existing customer problem at the earliest stages of the screening process; another inspiration from best practise and entrepreneurial literature (such as Blank and Dorf, 2012; Ries, 2011; Sull, 2004).

It needs also be noticed that before Volvo uses the below process, it needs to have categorised the idea to be radical, and not incremental. The process for an incremental idea screening would be very different, due to its different nature. This can *exempli gratia* be done through the model used and recommended by IDEO, mentioned by some in the case studies, see figure 6-1. Firms can also add a technology dimension.

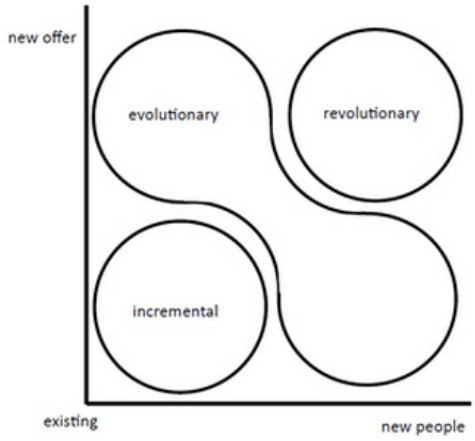


Figure 6-1 IDEO innovation categorisation matrix (CatalystStrategies, 2012).

6.1.1 Structure

A large firm like Volvo is recommended to have a process with three phases, which are designed to have three overarching focuses, with one common end goal. The overarching focuses of the three phases are the same for each radical idea going through the process, and so is the process' overarching goal. However, the activities, methods and time length needed within each phase will most probably differ for each idea, which hence require flexibility within the method. Ideas with high market uncertainty will not require the same information gathering or stakeholders to be engaged as an idea with high technology uncertainty but clear application. This reasoning is advocated by literature, best practise in firms today, and discussed by e.g. Bessant *et al.* (2010), who have researched over 150 firms' FEI practises! The three phases, their aims, and their nature are presented in figure 6-2 below. Figure 6-2 represents the analysis and compilation of literature within entrepreneurship and FEI, with findings from expert interviews and the multiple case studies performed by this report's authors.

When divided into three phases, the process can take into consideration the varying levels of information available, uncertainty level, and affected stakeholders, which will differ at each phase as the idea progresses and more information is collected. Importantly however, it is not to be regarded as a conventional stage-gate process merely due to its division into phases, which will be discussed further

down. Nonetheless, if large firms understand the different focuses of the varying phases of the screening process, and that the process has several sub-goals at different points in time, it will be easier for firm to understand the required actions succeed, compared to only knowing exempli gratia a list of methods and criteria to use. The three focuses included in the below presented process, see figure 6-2, also allow for the flexibility and culling activity needed in firm screening processes, aids in understanding what methods that are suitable, and communicates the tacit aspects of the screening process. Additionally, having three phases will provide a structure and common understanding, whereby it aids in creating the control needed in a large firm. This tension between control and flexibility for Volvo will now be discussed, under figure 6-2.

Front-end idea screening process structure for potential radical innovation. Authors' combination of literature, expert interviews and best praxis.

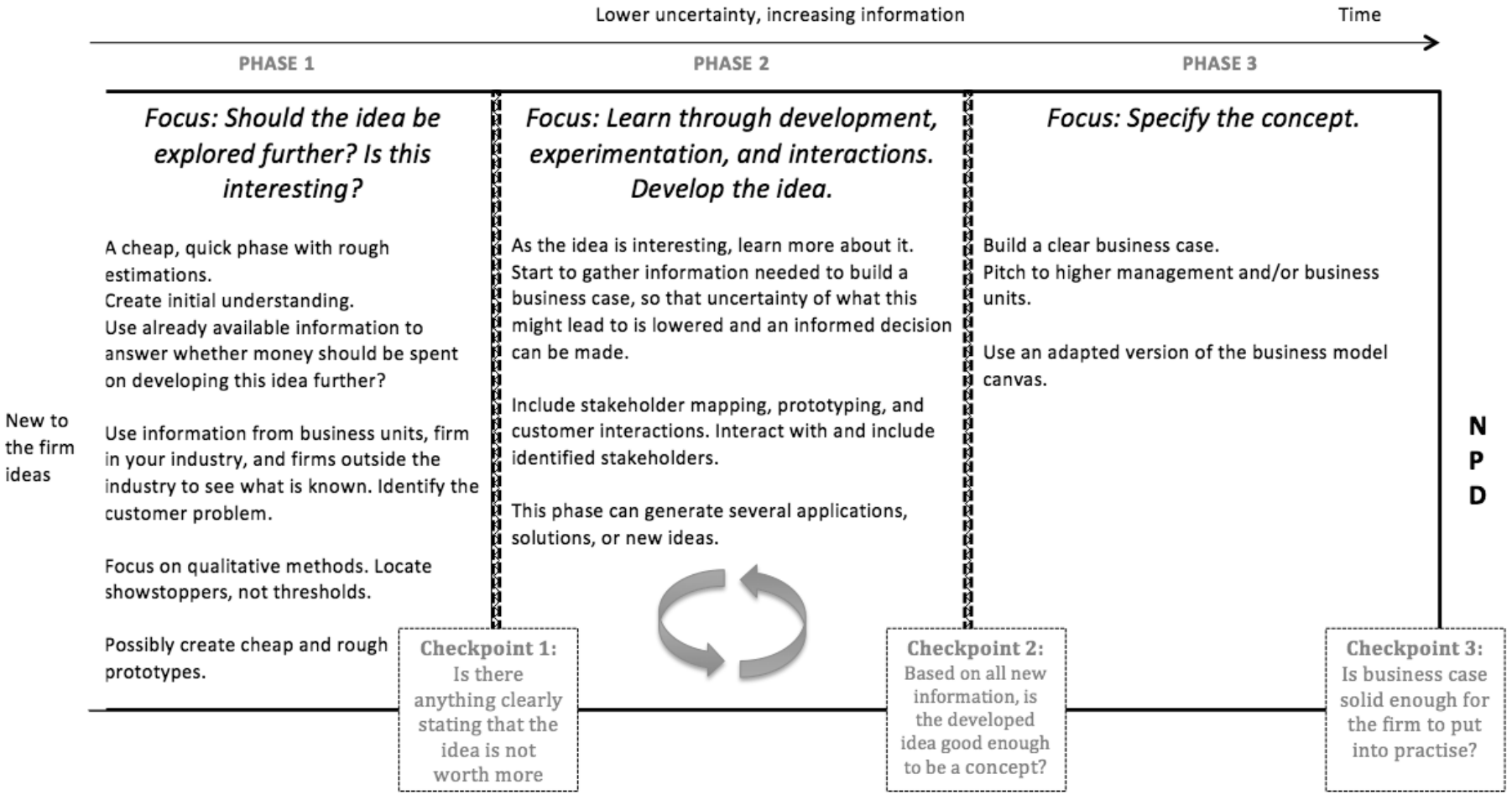


Figure 6-2 The proposed structure for Volvo's screening process for radical ideas.

Flexibility vs. Control

The process that Volvo as a large firm is recommended to use for radical idea screening needs to strike a balance between flexibility and control that is suitable for the specific firm. Radical innovation idea management is highly uncertain. Hence the process needs to allow for radical ideas to be protected and not be killed to early, iteration to take place, and this uncertainty to be present as a natural part of the process. Simultaneously, it needs to be adapted to the reality of Volvo's context: a large firm, dependent on set processes, that is to be understood by all so it is scalable and can be effective and efficient. Further, the annual report states that the new CEO prefers a process focus (Volvo Group, 2013), which adds to the reasons for why the process should be set and standardised to some extent for the firm. Both flexibility and control have pros and cons, which will now be discussed.

First, lets address the need for control. Volvo is as said a large firm, present in many markets and countries, constituted of many divisions, selling different products and services. The firm has bureaucracy constraints not experienced by entrepreneurs, and its size implies that many people will never have the chance to meet, or know of all activities that go on in the firm. However, they presumably still need to work in a coherent direction towards a collective goal. Hence, some of the perks that the analysis presented related to a controlled process will be beneficial for a firm like Volvo. That is true even though experts and literature in relation to entrepreneurship advocates a pursuit of total freedom in the process. Without a standardised process with control, the analysis showed risks that the firm will be too dependent on the tacit sides of people, their motivation and self-management, and knowledge. A large firm like Volvo can probably not ensure that everyone working with screening will pass on their gained knowledge, do not act in self-interest, is not influenced by politics, will understand everything needed for idea screening to be successful without direction, and will communicate and collaborate throughout the whole business so that a coherency is present. Further, the writers of this report also want to emphasise that a set process gives Volvo a possibility to learn and improve their screening work, even though this has not been explicitly mentioned in the analysis. A set process can also be scaled and passed on throughout the firm, to different countries and business units, which is in line with the company's aim. The process standardisation works a bit like an education tool, so that employees around the world can work with screening in a way that heightens the possibility for coherent and relevant radical innovation work. A set process has been shown to work great in firms: however, these processes have not been stage-gate processes in their traditional sense. They have rather been processes with checkpoints, methods, facilitating means, and guidelines. This is an important take-away. Literature discusses flexibility and control as two separate extremes. However, it is a continuum on which firms with different needs and strategies will fit somewhere along the way. A set checkpoint process inspired by the stage-gate set-up can still be flexible, and allow for radical innovations.

Secondly, there is as now apparent the need for flexibility, whereby the interesting discussion becomes the extent to which this should be done, and how it can be incorporated into a process. The proposed process framework is to handle work with radical ideas in the firm, and not incremental, as it is the focus of this research based on the identified FEI literature gap. Hence, there must be room for iteration, pivoting, changes and adaptation to new information to foster radical ideas. The analysis showed that there needs to be room for adapting the process to ideas requiring different time-spans,

number of stakeholder interactions, and focus on market or technology development. Hence, a set time frame for the phases, at least in phase 2, does not seem to be beneficial. The process is further recommended to simulate the VC process with checkpoints, which has been shown to be a good way to incorporate entrepreneurship. A way to allow for this is to have different sets of methods, criteria, and processes to choose from within the process, like modules. These will be discussed in the following sub-chapters. Related to this, the writers want to note that the evaluating team should not be scared of scrapping ideas that will not work. It is easy to become emotionally attached, and to see the scrapping as a failure. This is not the case; Volvo will not only know that it does not work, but *what* does not work and *why*. Hence, it will be easier to see in a later stage of the firm's life if the idea is something to maybe resume. Firms like Volvo are recommended to store and save ideas that did not work, and note *why* it did not, so that they can be used as inspiration later on in their work with radical innovations.

Further, it became evident through this research that the use of a business case – a light version suited to the level of uncertainty in the FEI phases, at the end of the screening process provides a desirable outcome. An important contribution of the findings is however that this should not only be to clarify the concept and lower the uncertainty, and provide information to the new product, process or services development team(s), even though these are known and importance factors. Also, it needs to sell the concept, and hence be visionary and interesting. In a large firm like Volvo, it seems right to assume the senior management is highly occupied with the tasks of running a large multinational business, and hence have little time to assess idea concepts. Hence, they need probably be convinced on both the business side, but also be persuaded and interested, during a short time period. Hence, a visionary and selling concept will probably be needed to attain the interest needed to persuade management to further develop the concept and bring it to the market. This has been implied in the interviews as well. The business model canvas is a good inspiration for this, as experts recommend it, firms speak of it positively, and as it also incorporates important aspects such as key partners. However, some areas of it are of less importance, and it also needs to be complemented, as it is not originally made for large firms but for entrepreneurs in an academic context. This will however be discussed further down.

6.1.2 Methods

There are many methods that can be, and are, used in firms. The important thing for Volvo to consider when choosing what methods to use is that the methods lead to different ends, and have different aims. Thereby, firms like Volvo will benefit from combining methods, and choose them depending on where in the process the firm is, what their task at hand is at the specific point in time, and what uncertainties that are connected to the specific idea. Methods should not be used because they are in a list, they should be chosen as means to achieve known sub-tasks and sub-goals encountered in the process.

Methods that are used early in the process should preferably not be harsh, but rather qualitative and let many ideas through so that valuable radical concepts will not be missed, to complement the process' structure and nature discussed and presented in chapters 6.1 and 6.1.1 above. They should further identify relevant stakeholders needed throughout the process, which will be discussed further under chapter 6.1.4 below, aid in identifying the showstoppers discussed in chapter 6.1.3 below, and help

locate cheap information regarding the ideas' relevance and requirements. That can be done through *exempli gratia* trend reports and through studying competitors or external industries.

Throughout phase 2, a large firm like Volvo needs to have methods aiding in developing and exploring the concept, including all relevant stakeholders, and relating it to relevant trends and the external environment. Volvo should also later on be able to compare ideas, further relate them to the overall business goals and strategy, and present them effectively to senior managers. If the firm keeps this discussion in mind, the methods can complement the structure, nature and aim of the process as discussed above. The methods in table 6-1 below have been categorised into different aims that can be related to this discussion. They also relate to different activities in the process presented above. Suggestions of exactly what methods to use will be presented in the overarching process representation at the end of this chapter, but will have to be adapted to the nature of the idea, *inter alia* whether it is driven by technology push or market pull. This, as they then will have uncertainty levels focusing on different areas, and can affect different stakeholders such as business units. The latter will be further discussed below in chapter 6.4. Some of the methods presented in table 6-1 can be used to reach several ends. However, then Volvo must understand that they are to be used for different things, so that the varying aims of the same model do not go unnoticed. Examples of these are exempli gratia portfolio management matrix, the business case, and the customer development process.

Table 6-1. Methods that can be used in Volvo's screening process for radical ideas.

Aim of methods	Method	In what phase could it be used?	Phase
- Simulate the VC way **- Allow for radical ideas** **- Ground concept in customer problem** **- Iterate, explore and learn**	- Customer Development Process combined with a business model canvas - Lean Start-Up. - Hackathon	Essece of them can be used throughout. Most relevant in phase 2-3	**1, 2, 3**
- To compare **- To assess novelty of idea**	- Technology Radar - Gartner's priority matrix - Portfolio Management - IDEO matrix - Risk/Uncertainty matrix	In phase one - rough assessments of: - IDEO matrix - Portfolio Management - Risk/Uncertainty matrix	**1**
- To choose	- Criteria - Balanced Score Cards - Trend analysis - Business model canvas - Competitive analysis - Analysis of external world - Portfolio Management - Risk Matrix	Rough assessments in phase 1 In phase 2: - Trend analysis - Competitive analysis - External World analysis - Business Model Canvas At checkpoint 2: - Criteria - Balanced Score Cards - Business model canvas . Portfolio and risk matrix	**1, 2**
- To define business case **- To evaluate**	- Competitive analysis - Business intelligence - Stakeholder mapping - Open Innovation	Use throughout the process Consider them early	**1, 2, 3**
- To define stakeholders to include	- Pitching times - Stakeholder mapping - Customer Development Process	Mostly in phases 2-3 Consider stakeholder mapping in phase 1	**1, 2, 3**
- To unviel uncertainties **- For assessments** **- Identify gaps**	- Questions of desirability, feasibility and desirability. - Real-Win-Worth matrix - Business models	RWW - multiple stages	**1, 2, 3**
- Senior Management Inclusion	- Pitching - Idea Juries - Dragon's Den - Champion allocation - Allocate managers to be sponsors, or resource and knowledge champions to projects	Idea Juries and Dragon's den should be used after phase 2. However, to include champions, and aid teams to develop concepts should be done early cn throughout the process.	**2, 3**
- To gain the correct lenses for evaluating the ideas	- Trend analysis - Foresight - Scenario planning - Story telling - Metaphors	Use throughout the process Consider them early	**1, 2, 3**

6.1.3 Criteria

As has now been evident, the process is a culling activity, with early assessments that need to let both good and bad ideas through in the beginning for radical ideas to be fostered. This relates back to the discussion in chapter 6.1 regarding that there is high uncertainty in the screening process in the beginning, whereby Volvo and other firms will not be able to find the diamonds early on. Ideas for potential radical innovation should preferably be understood through some information gathering before a fair evaluation can be done. The use of criteria can be positive throughout the process, but they need to follow the same culling principle as the process and the method choices, so they contribute to fostering good business concepts for radical innovations throughout. The use of criteria – and especially so the use of overarching areas with related choices of criteria – is a straightforward way to show the screening team(s) and other employees what areas that are of importance to consider when screening for radical ideas. Hence, they can work as guidelines, and need to be set specifically for each firm's strategy, capacity and goals, and the process' structure. Areas of criteria also help to create consistency and coherency when the process is scaled, and can mitigate the harms of politics. If the screening team needs to sometimes present results relating to the same answering overarching areas of criteria, the risk of them skipping areas of importance due to politics is lowered. Hence, it is something that should be included in Volvo's screening process for radical ideas. However, the recommendations in this report will focus on the areas of criteria to be included, and thereafter provide suggestions of specific criteria in the form of questions to ask within each area. There is not enough firm specific information available, nor are radical ideas similar enough, for this research to present a realistic black-and-white checklist. Once again, the aim of the presented methods in each phase is important to consider, where different methods will relate in aiding to gather information, knowledge or relationships required to address the areas of criteria throughout the screening process. A presentation of areas of criteria that Volvo is recommended to consider is presented in table 6-2 below. These areas are based on what the analysis of literature, expert interviews and best praxis has shown that large firms need to consider when developing a concept so that no important area is left behind. Further, these areas will together see to that the areas of a business case is covered, will take into consideration the specific firm's competencies and resources, and will further highlight stakeholder mapping required.

Table 6-2. Areas of criteria to use in Volvo's screening process for radical ideas. Suggested criteria.

Desirability	Feasibility	Viability	External Environment
Product Advantage	**TECHNICALLY**	Profitability approximations	**MARKET**
	Originality/uniqueness	Required investment	Market: - attractiveness - growth rate - size
Customer acceptance	Is it feasible?	Financial Return	Competition: - strengths and weaknesses - 4 Ps
Trends	Newness level - right newness level?	Project size	Marketing strategy
Customer problem	Technology risk	Business impact	Market potential
Customer wants	Technology unknowns	**Strategic fit**	Target market
Customer needs	Is it doable?	Strategic alignment	Market risk
Value proposition	Enabling sciences required	Strategic priorities	
Customer benefits	Time to develop?	Long term and short term fit	**Outside world**
Potential for really large market?	**ORGANISATIONALLY**	Business strategy	Trends
	Fit with firm resources and experiences	Innovaiton strategy	Environmental factors
	Organisational capabilities	Vision	Regulations
	Time and budget limitation	How does it compare to other ideas in the pipeline?	Trends
	Firm culture and leadership	Restrictions from e.g. Board directions	PESTEL
	How far does the competencies require lie from the firm's?	Alignment with firm values	

Checkpoint 1

The authors of this report has further also related the areas and criteria in table 6-2 above to the process structure presented in figure 6-2, to meet the aim of this report and show how all areas relate and affect each other. The analysis showed that the criteria should not be specific, nor be yes/no questions, at checkpoint 1. Rather, they should be areas working as guidelines for what Volvo should look into to be able to assess, qualitatively, whether to start developing the concept more or not and allocate a sum of capital to that process. A good way of doing this is by the use of showstoppers. This means that Volvo should preferably rather look for hinders within the most important areas of criteria at checkpoint 1, rather than thresholds or exact measures. The uncertainty is too high for that specific kind of criteria to be practically possible to use in the early phases. The reasoning further relates back to that firms cannot find the diamond ideas at the early phases of the screening process. Therefore, Volvo is recommended to look for hinders that would clearly state that there is no point in developing the idea. More can probably not be said at this early stage.

The analysis showed that desirability is of great importance and should be included from the beginning. Firms and experts were clear in the importance of early on grounding the concept in a customer problem. Hence, this needs to be considered at checkpoint 1. Further, it should be assessed whether

the idea will somehow be a strategic fit. This does however not mean the strategic objectives, as they are too close into the future, but rather that it does not directly oppose the vision, such as having no relation to contributing to that the firm can deliver transport solutions of any sort, so that some coherency in the firm's direction is created. Checkpoint 1 should also ask whether the technology is possible – not whether Volvo can develop it, but rather if it is contrary to any laws of nature. Even though it has been emphasised that a financial assessment is very hard to do at the earliest phases, the process needs to be contextualised to the reality of a large firm. There, profitability matters. However, it should be assessed taking into consideration that it is very hard, and will always be very rough estimates early on. Volvo should however at checkpoint 1 be able to see that the market is not certainly too small, due to that *exempli gratia* the total market represents a very small number of potential customers, rather than estimating whether it is big enough. Therefore, market potential can be roughly estimated in the early phases as done by AstraZeneca, focusing on what the market size would be if the whole problem itself was solved, independent of the application. This is hence a customer problem oriented method, and will reveal a showstopper: if the total problem is solved for all potential clients, the market cannot obviously be too small compared to the firm's revenue activities. Hence, at checkpoint 1, criteria collectively rather becomes areas to consider to identify any showstoppers. It is of great importance to ground the developed concept in a real market problem, want or need, whereby desirability should not only initiate the evaluation areas, but also follow through the screening process. Simply put, no other area of criteria will really matter if the end concept is not sought after. It is this reasoning that highlights the importance of customer interaction early in the process, and having people that listen and revise the concept based on customer feedback. In this process, Volvo needs to look out for latent customer needs, and the risk that customers are not able to explicitly state their needs. Hence, it is better to focus on the *problem* than the need early on. Areas of criteria related to checkpoint 1 are presented in figure 6-3 below.

Checkpoint 2

After checkpoint 1, areas that are to be used for screening have been showed to be market, technological feasibility, strategy and vision, risk, financial assessment, soft sides, external environmental analysis, time, newness level, the areas of the business canvas, and regulations. These have been re-categorised to fewer categories so that they are easier for Volvo to absorb, and are the ones presented in table 6-2 above. The areas in table 6-2 should all be considered after checkpoint 1. If the idea moves through to exploration in phase 2, information of these areas that is missing for the specific idea should be gathered, which should be aided through the use of relevant methods. The further into phase 2 Volvo's team(s) will proceed, the more areas of criteria can be answered, with less uncertainty in the answers. Through this, the process in phase 2 also directly works towards meeting the end goal of the screening process for radical ideas: develop clear business concept(s) for relevant ideas for radical innovations.

Different criteria, and areas of criteria, will be answered at different times of the process depending on the market application, whether it is a service or a product idea, and depending on whether the idea is market or technology driven. Thereby, what specific criteria to use every time cannot, and will not, be presented in detail to Volvo in this report for phase 2 and onwards. It is also important to notice that, as specific criteria are related to specific opportunities, each firm needs to decide what criteria that have

most importance in relation to their goals, strategy and vision. However, suggestions for what criteria to include in each phase are presented in figure 6-3 below, based on the understanding and knowledge of the writers of this report. It should be noted that all those areas preferably should be regarded by Volvo when they screen radical ideas. It is the specific criteria within them that will differ. At checkpoint 3, the areas and criteria will be an adapted and extended business model canvas, as previously mentioned.

Checkpoint 1: Is there anything clearly stating that the idea is not worth more attention?

Checkpoint 2: Based on all new information, is the developed idea good enough to be a concept?

Checkpoint 1 - Showstoppers
Desirability **- Is there an existing customer problem to be solved? (internal and/or external)**
Strategic Fit **- Does it go against our long-term vision?** **- Is it contrary our core company values?**
Viability - Market potential - Is the full market potential when solving the problem for all potential customers too small?
Feasibility - Does it stride against any laws of nature? - Is there an indication that we will be hindered by IP rights or regulations? - What internal and external stakeholders are expected to be affected?

Checkpoint 2 - Criteria	Checkpoint 2 - Criteria	Checkpoint 2 - Criteria
Desirability - Do we solve an existing problem? - Do we need a market need? - Do we have specific customer feedback validating this? - Are these customers representative for the thought market?	**Feasibility** - The concept's newness-level. - What resources and competencies are required that lies outside the firm's current ones? *Knowledge/Production facilities etc.* - What enabling sciences are required? - What external and internal expertise do we need to bring in to develop the technology? If so, can we receive it? - What is the approximate expected time for technology development? - How much effort will it require to develop the required technology?	**Market** - What is the target market? - What is the target market's size and growth rate? - New or existing market? - What are competitors doing at the moment? - Is there a gap not filled by our competitors? - Have our competitors tried this and failed? What is the difference with our attempt?
Strategic Fit - Does it aid in reaching our long-term vision? - What, if any, strategic goals is it meeting? - How does it fit in our portfolio? - How does it complement our existing pipeline? - Should the idea instead be incubated elsewhere? - Is it within our key focus areas? (If the firm has any)	**External environment** - Is it aligned with current trends? *Technology/Consumer/Industry* - What is done in other industries in relation to this? - How will the concept be affected by future regulations? - How will the concept be affected by political changes/trends? - How will the concept be affected by cultural differences in the thought application markets?	**Viability** Estimations of: - Costs - Revenue expectation - Revenue stream - Business impact **Risk** - Technology risk - Market Risk
	Other - Is all information needed to make a decision available? - Does something need to be iterated or further explored before the concept is defined? - Will this still be relevant when launched?	

Figure 6-3. Criteria's relation to the phases of the proposed screening process for radical ideas for Volvo.

It is important for Volvo to understand that ideas for radical innovations cannot be compared based on the same metrics at the end of the process, as they can have very different nature and relate to very different business outcomes. Rather, they should be compared based on their overall fit in the pipeline, potential value, and long-term possibilities.

6.1.4 Stakeholders

The findings have shown a much greater dependence on stakeholders in the screening process than previously emphasised in literature, whereby this needs to be included in the design of the model that will be proposed to be used by Volvo. The screening process is performed by people and operated by people. The ideas are developed and judged by people, and sold along to business units or NPD teams made up of people. The finished products, processes, or services should then match wants and needs of internal and/or external customers. Hence, affected internal and external stakeholders should be mapped early on, so that the dependence on peoples' feelings and intuition is mitigated, and so relevant expertise can be gained. This also includes identifying business units to both gain their expertise and knowledge of the application and/or technology, and to increase their acceptance of the developed idea through inclusion. At a large firm like Volvo, the development continues in *exempli gratia* their set GDP processes. Hence, 'what comes next', and who is involved in the stages after the screening process, is also important to understand, in addition to who is to be involved in the screening process *per se*. This relates to a gap in the literature, which does not take this into consideration in the design of various parts of the screening process. This is one important part of the above statement that the process should not be thought of as operating in vacuum. It needs to be related to the remaining business, the customers, the industry, and the world. This understanding is a contribution of this research. The importance of including stakeholders has also been evident through the above discussion regarding criteria. To gain all required knowledge to address the areas of criteria, and bridge the gaps in firm competencies, stakeholder management and interactions will be necessary early on. The discussion of this paragraph leads to an addition of the questions to ask at checkpoint 1, so that phase 2 and 3 will not be hindered, see figure 6-4.

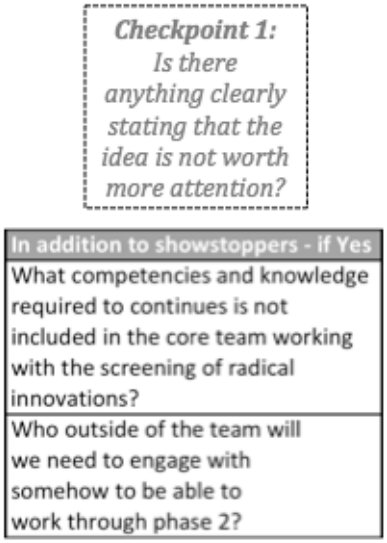


Figure 6-4. Addition of stakeholder mapping in the screening process.

Further, as the ideas are to be developed by people and judged by people, it becomes important to understand preferable traits and knowledge required by the Volvos management and employees responsible for the screening process. One area that is not discussed in literature, yet important to consider, is whether a large firm like Volvo should include the idea generator in the screening process or not. It can serve as motivation for employees, and ensure that important knowledge of the idea is not

lost through exclusion of its carrier. It can also simulate the VC way, which is directly related to building concepts from radical innovation ideas. Additionally, the idea carrier may have knowledge or competencies aiding in her/his recognition of the idea, which could be needed ahead in the screening process. Further, it has been shown that management should show support and interest to create goal commitment, and the inclusion of idea carriers can most probably aid in this. However, on the contrary, it has been pointed out that there are risks with the idea carrier not being the right type of persona, that they are not motivated by the right reasons, or are not good at screening work bur 'merely' idea generation. It seems also unrealistic that a firm with so many employees as Volvo, and hence many possible radical idea carriers, can promise or have as best practise to always include all idea carriers fully throughout the screening process. However, a middle ground should preferably be found. Idea carriers can be included in the early phases of the development, when the development is to be done by the core team. Hence, the idea carrier is recommended be included in the beginning, be informed of progress, be thanked for their initiative, and also if possible be offered to aid in some parts of the process.

As stated, it is also important that Volvo actively thinks through team(s)' configuration, that will be working with the screening process of radical ideas. The analysis showed that radical innovation screening should be done with experience and not by junior colleagues, whereby the same team(s) should work with managing and overlooking the process. This also creates consistency and effectiveness in the work, is best practice amongst firms, and is good for Volvo as it already has the innovation and planning team that has previous experience from radical innovation work at the firm. It is also important to consider, as the field of entrepreneurship has showed that experience and knowledge will affect how an opportunity is perceived. Hence, a mix of experience and knowledge is most likely to prefer. Then, however, Bessant's comment of external reviews of the team's performance can be needed, as the same core team can probably create informal routines, and base decisions on intuition. Hence, they can need an external check, whereby pitching to management presumably is a good activity when the concept is developed. The core team is however recommended to always be complemented by representatives from business units, experts within idea specific relevant areas, and include the idea generator when possible, at least in the earliest phases.

The analysis also showed that the team needs to be aware of their outside world, and connect the dots of political, technological and consumer trends to their work. Hence, this sheds light on the criteria and methods above ensuring the inclusion of this knowledge and way of thinking. The knowledge not present in the team that is identified to be needed for each innovation idea needs to be gained from elsewhere, once again emphasising the importance of stakeholder mapping early on in the process. The research has further showed that the team needs to be intrinsically motivated, have a manageable curiosity and drive, and cope with the uncertainty underlying radical idea management. Hence, it is also important for higher management to engage in their work, and show appreciation, so that the motivation is fostered. The team should further have cross-functional knowledge, a focus on representing both technology and market competencies, and the specific market or application should somehow be represented. All this also relates back to what is needed to be successful at developing the marketing and technology sides to lessen the uncertainties present in phase 2.

Moreover, to increase the screening capacity of firms such as Volvo's core team(s) and assure idea generator inclusion and motivation, large firms can presumably benefit from incorporating inclusion of the idea generators from the viewpoint of methods such as Dragon's Den and/or Hackathons at different points in time. These types of events further promote an innovative culture. This can either be done through that the core team communicates broad areas of interests that they have identified as important through methods such as trend-analysis and scenario planning, or for continuously submitted ideas with high newness levels. Then, the screening team can act as VCs at the checkpoints in the process, and as champions of the different projects through being knowledge and resource sponsors, perhaps together with a representative form the relevant business unit. Through this, the team will not experience the same limited capacity stemming from its size, as different members can also help and evaluate different teams, coach generators in how to build up a business case, and then engage/take over the concept at a later stage if necessary. If this is to be done, however, the credit should preferably still go to the idea carrier, so (s)he does not feel that the team will take credit for their work, and they should if possible be allowed to participate in the last pitch to senior management. This set-up could also be one way to scale the process, and ground it in the different cultures and the like of Volvo's varying markets and business locations. Is this to be done, education in how to use the process and how to relate to the criteria is important, and the employees will need to be properly given time to work with the development as part of their work-schedule. The concepts have been shown to work in several firms, and could complement the work that a core team performs. It is though important to note that everyone does not want to work with idea development, and everyone is not suited to do so. Hence, the personality and motivation of the idea generator needs to be taken into account, as became evident in the report's analysis chapter. To ensure management inclusion, the pitching of concepts when they are developed seems to be a realistic choice, which is also done in many firms. However, management is recommended to engage earlier in the phases to show support, through *exempli gratia* be part of idea juries, or give feedback along the way of developments.

The discussion has showed that the team needs information about trends, from foresight work, about direct and indirect competitors, same and other industries' work with interesting concepts, customer feedback, and business units. The latter is of more importance than explicitly stated by the literature and firms. Business units are internal customers, and hence they are Volvo's team's indirect internal customers. As reasoned in the analysis and above, they should be informed and included to the extent that not only their knowledge about the application and/or technology is gained, but so that acceptance of the idea will be gained. It is important for firms to consider that radical ideas bring uncertainty and changes into peoples' ways of working, routines, and can quite easily stir emotions. Thereby, the process is once more not only black-and-white lists of criteria and methods: it needs to be anchored in reality, the internal environment, and the outside world.

Something directly related to the above discussions is contextualisation. As there are stakeholders involved with different competencies, vocabulary, interests, experience and ranks of position, the same content will have to be adapted to its receiver, as though only mentioned by Elerud-Tryde. It lies outside the scope of this report to research and present how this explicitly should be done. However, it is interesting and relevant to mention in this discussion. This can *exempli gratia* regard the use of the business case. The business model canvas may need to be adapted. Not just to the language of a large

firm instead of academic language regarding entrepreneurship, but also to different business units, and if used in Dragon's Den events. However, when it is to be presented to higher management, the terminology and emphasis can be, and should be, different.

Radical innovation screening clearly needs management support for motivation and resources, where more radical concepts need more central governance. This highlights a reason for why a core team pitching to senior management, sometimes including Dragon's Dens and Hackathons, are viewed as positive. Higher management can be explained to work like VCs in firms today, where firms to a higher or lower extent pitch concepts throughout, or at the end of, the screening process, to receive feedback or yes/no decisions. However, highest management should not have to be contacted every time resources such as capital is required, but rather have that final go/no-go decision. The core team can have a budget for screening of radical innovation to their disposal. This is more effective in the reality of a large firm, with its focus on existing business and strong time constraints. A pitch set-up also allows for management participative inclusion making, which has been shown to motivate employees with entrepreneurial traits. Nonetheless, management support is essential in the sense that resources are needed, both time and monetary, uncertainty needs to be accepted, and management power is required so that the developed concepts will actually be taken onwards.

6.1.5 The adapted business model canvas

Throughout the analysis and discussion above, it has been shown that the end result of the screening process is a business case, which will work as a decision support for the developed concept. The business model canvas, as presented by Blank and Dorf (2012) and mentioned by firms and experts, includes areas that have been identified in this discussion as importance in the screening process for potential radical innovation in large firms. Further, it is based on grounding the development of a concept in customer problems and the solution of those problems. Hence, the business model canvas is beneficial to use as a foundation for presenting the concept after phase 3. However, one must remember that this canvas is originally to be used by small start-ups through their whole process of setting up a firm. This research however 'only' regards ide screening in the earliest stages. Therefore, all areas of the business model canvas cannot be answered as explicitly and detailed as at the end of a traditional customer development process. The development of the concept in the firm will continue trough *exempli gratia* new product, process and services development, and further input may be needed. Therefore, some of the areas can be specified in these stages rather than in the FEI stages that this report regards. The eight areas of the business model canvas, how they relate to the context of a large firm like Volvo, and recommended additions to the canvas will now be presented.

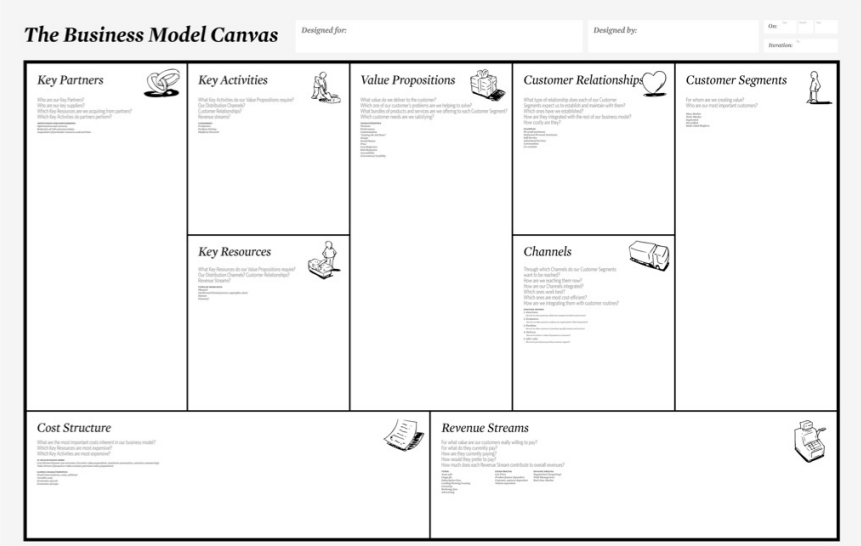


Figure 6-5. The Business Model Canvas (Blank and Dorf, 2012:94)

The *value proposition* and *customer segments* will present the essence of the concept, and its foundation in an existing customer problem. This is of great importance, as desirability was shown to be one of the key areas to regards in the discussion regarding criteria above. Hence, information about the problem and values presented needs to be very clearly transferred to the development teams that are to continue the development and concept specification. This also needs to be well understood, and is an essential part of the business model canvas.

Key partners and *key resources* can be used to present stakeholder management needed for further development, and what resources that are required external to the firm as well as internal. As this discussion is related to the context of a large firm like Volvo rather than a start-up, the two areas in the business model canvas ought to clearly state what partners and resources that can be found internally, and what needs to be gained externally. This is not emphasised in the original business model canvas. This way, the firm can exploit and learn from internal resources, and then see what will be needed externally and from where. At the earlier phases of the process, such as in phase 1, this can also be used by the core innovation team to identify the same for that screening team's work.

Key activities can present what the new product, process or services development team will need to focus on next, and also show what activities that have been performed that are of importance to explain the concept. However, it will probably be too early in the process to adequately specify what *channels* that are to be used. However, this has not been specified in the analysis to be a necessity to understand in these early FEI phases. It can instead be done by *exempli gratia* marketing teams later on in the development process. If information of it has been found, it can however of course be presented as guidelines. The same reasoning goes for *revenue streams*. Even though estimations of income can be made, interviews showed that it can be too early in the process to specify an exact price and/or pricing model for a concept when the concept still lies within the FEI rather than the NPD. The two areas also need to be looked at in relation to distribution channels and pricing models that the firm currently uses.

The presentation of the canvas should however also relate the information to the firm's current portfolio, so it becomes clear what is known and what is needed onwards. Further, the analysis showed that firms also use the business concept specified in the screening process to sell the concept forwards. Hence, it is recommended to complement the canvas with a visionary part and not 'only' present the traditional business model canvas. This could be relating the concept to external trends and scenarios, to show the prototype, or to create a series or film, so that it appeals to the audience and generates interest. Further, the analysis and above discussion has also showed that the developed case should preferably be related to trend reports within areas from the PESTEL framework and the like, to relate it to the outside world. This to see the concept's relevance in the external environment, understand complementary technologies' readiness level, and to understand when in time the concept will be relevant in relation to upcoming trends. Hence, this perspective should be added to the business model canvas.

7 Conclusion

The purpose of this study was to understand how a large company, such as Volvo, should organise their screening process for potential radical innovation. The result of the study is a framework, designed by the authors and includes four different areas: *structure* of the screening process, the *methods* to use for experimentation, and inclusion of champions and management, *criteria* for evaluation, and *stakeholders* that affect and are affected by the screening process. Since there has been a focus on large firms like Volvo and potential radical innovation, the framework is adapted to that sort of context.

The authors recommend large firms like Volvo to have the structure as seen in the figure below. It is the authors' own design based on results from the research's three studies, namely the literature study, the multiple-case study and the expert interviews. The figure is presented in a larger scale in the discussion, see figure 6-2. The process is a culling activity, with nice and qualitative assessments early on, coloured by low level of available information. The three phases have different focuses, different levels of uncertainty and different levels of available information. Therefore, the phases have different aims, but overall the same goal – to help the screeners make informed decisions. The authors want to note some areas not emphasised enough in the literature. The screening process is more than a culling activity; it is a learning process, based on *inter alia* iteration and prototyping whereby it is not the same idea that will flow through the process. Furthermore, the authors recommend including stakeholder mapping early in the process, to be able to get the relevant internal and external expertise as well as help gaining acceptance of the innovation to be developed. The field of entrepreneurship, as well as the empirical research, also highlighted the importance of identifying a customer need to ground the concept development in early on.

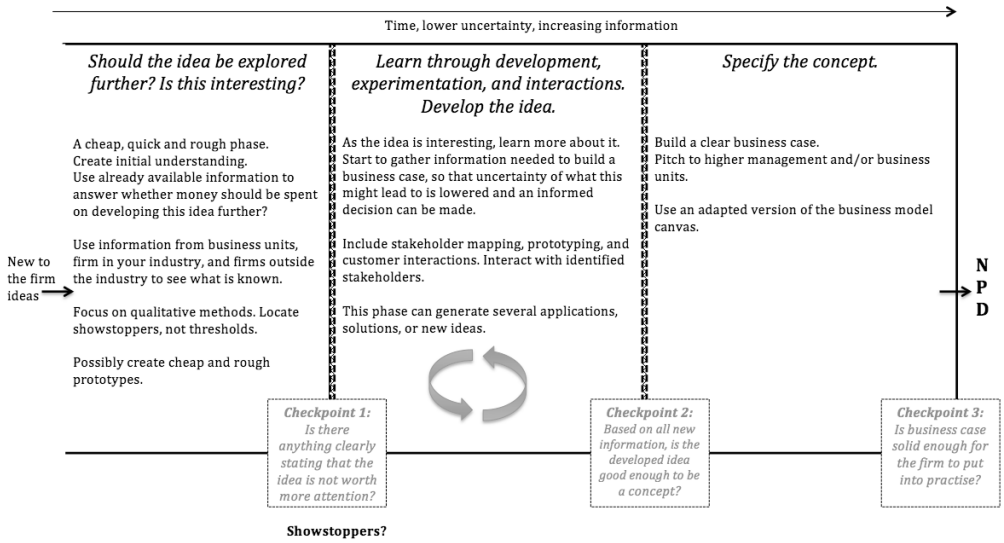


Figure 7-1 – The structure of the screening process – own design.

The authors have identified various different methods to be used throughout the screening process for large firms. The full table has been presented in the discussion chapter, see table 6-1, and shows a compilation of all the methods that have been identified as beneficial to use in the different phases of the screening, depending on what the aim is with the activity. These methods could be seen as

modules, where different ideas will have different combinations of methods throughout the process depending on what type of information one is looking for. To be noted is that there is not *one* method for everything, but rather a combination of the various methods. The different methods have different purposes, where focus lies on being able to experiment, include stakeholders and help set-up processes.

Regarding the criteria to use, there should not be a specific set of criteria but rather key areas. In the earliest phase of the project, the authors recommend to use showstoppers. This means that they should look for hinders at checkpoint 1 rather than traditional criteria, and to evaluate the idea based on fewer areas than in checkpoint 2. This, as radical ideas need time to develop to prove whether they are good possibilities for the firm. Firms are recommended to look for hinder within the areas of desirability, strategic fit, viability – market potential, feasibility, and stakeholders and competencies, see figures 6-3 and 6-4. The criteria at checkpoint 2 can be more extensive and harsh as new information has been collected, and market and technology risks have been lowered. The authors identified eight areas in which a large firm like Volvo could evaluate ideas. If these are all taken into consideration, they aid in seeing to that information required for building a decision support business case is considered, and that the idea is related to the external environment. The previously presented methods affect what criteria that can be answered.

There was a lot more emphasis on the involvement of stakeholders in the findings than in the literature. As already mentioned, large companies could benefit from conducting stakeholder mapping early, to be better prepared for who is to be affected and who is to affect the screening process. Furthermore, it could be beneficial to simulate the VC process, and thereby include the idea carrier in the beginning of the screening. Methods such as Dragon's Den or Hackathons could be considered. Furthermore, it is beneficial if the same team(s) works with managing and overlooking the process since it can create consistency and effectiveness. Additionally, there should be a mix of experience and knowledge, as well as cross-functional knowledge, representing both technology and market competencies. However, external reviews of the team's performance can be needed, since the same core team probably can create informal routines, and base decisions on intuition. Therefore, external checks from higher management in a pitching event could be beneficial, as well as complementing the core team with relevant experts and business unit representatives. Moreover, management support seems to be needed when screening ideas for potential radical innovations, and a more central governance function is deemed appropriate. A pitch-setup is viewed as positive. It allows for management participative decision making, which has been shown to motivate employees with entrepreneurial traits. Nonetheless, management support is deemed essential in the sense that resources are needed, both time and monetary, uncertainty needs to be accepted, and management power is required so that the developed concepts will actually be taken forward.

The framework has not been applied nor tested empirically, which therefore points to further studies to verify the framework.

8 Reference list

Ardichvili, A., Cardozo, R. and Ray, S. (2003) A theory of entrepreneurial opportunity identification and development. *Journal of Business Venturing 18:1,* pp. 105-123.

Bessant, J. R. and Tidd, J. (2009), *Managing Innovation: Integrating Technological, Market and Organizational Change*. Chichester: John Wiley & Sons Ltd.

Bessant, J., von Stamm, B., Moeslein, K., M., and Neyer, A-K. (2010) Backing outsiders: selection strategies for discontinuous innovation *R&D Management.* 40:4, pp. 345-356

Blank, S. G. and Dorf, B. (2012) *The Start up owner's manual: the step-by-step guide for building a great company*, Pescadero, California: K&S Ransh Press

Boeddrich, H-K. (2004) Ideas in the Workplace: A New Approach Towards Organizing the Fuzzy Front End of the Innovation Process Creativity and *Innovation Management* 13:4, pp. 274-285.

Boston Consulting Group (2013) The most innovative companies 2013 [online] Available at < https://www.bcgperspectives.com/content/articles/innovation_growth_most_innovative_companies_2013_lessons_from_leaders/?chapter=2> (Data retrieved on 2014-03-24).

Bryman, A. and Bell, E. (2007) *Business research methods,* New York: Oxford University Press Inc.

Burgelman, R., A. (1983) A Model of the Interaction of Strategic Behaviour, Corporate Context, and the Concept of Strategy *The Academy of Management Review* 8:1, pp. 61-70.

Carbonell-Foulquie´ , P., J. L., Munuera-Aleman, and A. I. Rodriguez-Colarelli O'Connor, G. and Rice, M. (2013) A Comprehensive Model of Uncertainty Associated with Radical Innovation, *Journal of Product Innovation Management* 30:1, pp. 2-18.

Catalyst Strategies (2012) What is innovation [online] Available at < http://catalyststrategies.com/2012/what-is-innovation/> (Data retrieved 2014-05-23).

Chotigeat, T., Pandey, I. M., and Kim, D. J (1997) Venture Capital Investment Evaluation in Emerging Markets. *Multinational Business Review*, 5:2, pp. 54-62.

Colarelli O'Connor, G. and Rice, M. (2013) A Comprehensive Model of Uncertainty Associated with Radical Innovation, *Journal of Product Innovation Management* 30:1, pp. 2-18.

Cooper, J.R., (1998) A multidimensional approach to the adoption of innovation. *Management Decision,* 36:8, pp. 493-502.

Cooper, R. G. (2011) Perspective: The Innovation Dilemma: How to Innovate When the Market Is Mature. *Journal of Product Innovation Management* 28:1, pp. 2-27.

Dingsøyr, T., Dybå, T. and Moe, N. B. (2010) *Agile Software Development: current research and future directions* [eds.], pp.1-30, Trondheim: Springer

Dougherty, D. and Hardy, C. (1996) Sustained product innovation in large, mature organisations: overcoming innovation-to-organisation problems. *The Academy of Management Journal* 39:5, pp. 1120-1153.

Eisenhardt, K., M., and Zbaracki, M., J., (1992) Strategic Decision Making *Strategic Management Journal* 13:1, pp. 17-37.

Elerud-Tryde, A., and Soonvald, A. (2011) *Proposing a framework for evaluating and selecting ideas in the FEI: A case study of Volvo Cars,* M.Sc. Thesis, Chalmers University of Technology

European CEO (2014) Olof Persson [online] Available at <http://www.europeanceo.com/profiles/2014/03/olof-persson/> (Cited 2014-05-02).

Faure, C. (2004) Beyond brainstorming: Effects of different group procedures on selection of ideas and satisfaction with the process. *Journal of Creative Behavior*, 38:1, pp. 13–34.

Fast Company & Inc. (2014) The world's most innovative companies 2013 [online] Available at < http://www.fastcompany.com/section/most-innovative-companies-2013> (Data retrieved 2014-03-24).

Flick, U. (2009) *An introduction to qualitative research,* London: SAGE Publications Ltd.

Forbes (2014) The world's most innovative companies [online] Available at < http://www.forbes.com/innovative-companies/list/> (Data retrieved 2014-03-24).

Garcia, R. and Calantone, R. (2001) A critical look at technological innovation typology and innovativeness terminology: a literature review. *Journal of Product Innovation Management* 19:2, pp. 110-132.

Gassman, O. and Schweitzer, F (2014) *Management of the Fuzzy Front End of Innovation* London: Springer International Publishing Switzerland.

Gaubinger, K. and Rabl, M. Structuring the Front End of Innovation. In (eds.)
Hart, S., E. J., Hultink, N., Tzokas, and H. R. (2003) Industrial companies' evaluation criteria in new product development gates. *Journal of Product Innovation Management* 20:1, pp. 22–36.

Hart, S., E. J. Hultink, N. Tzokas, and H. R. Commandeur (2003) Industrial companies' evaluation criteria in new product development gates. *Journal of Product Innovation Management* 20:1, pp. 22–36.

Hengquing, T., Yichao, P., Yang, Y., Shudan, L., and Hengwen, L. (2010) Evaluation of Venture Capital Based on Evaluation Model. *Technology and Investment*, 1:1, pp. 201-204.

Hoegl, M. and Parboteeah, K. P. (2006) Team goal commitment in innovative projects, *International Journal of Innovation Management* 10:3, pp. 299-324.

InnovationManagement.se (2013) Online learning [online] Available at < https://www.innovationmanagement.se/> (Data retrieved 2014-03-24)

Khurana, A., and Rosenthal, S.R. (1998) Towards Holistic "Front Ends" In New Product Development. *Journal of Product Innovation Management* 15:1, pp. 57–74.

Koen, P., Ajamian, G., Burkart, R., Clamen, A., Davidson, J., D Ámore, R., Elkins, C., Herald, K., Incorvia, M., Johnson, A., Karol, R., Seibert, R., Slavejkov, A. and Wagner, K. (2001). Providing clarity and a common language to the “fuzzy front end”, *Research-Technology Management*, 44:2, pp. 44-55.

Langerak, E., Hultin, J. E., Robben H., S., J (2004) The role of predevelopment activities in the relationship between market orientation and performance *R&D Management* 34:3, pp. 236-247.

Leifer, R., Colarelli O’Connor, G. and Rice, M. (2001) Implementing radical innovation in mature firms: The role of hubs. *The Academy of Management Executive* 15:3, pp. 102-113.

Marshall, C., and Rossman, G. B. (2006) *Designing Qualitative Research Thousand Oaks*: SAGE Publications Ltd.

Mintzberg, H., and Waters, J. A. (1985) Of Strategies: *Deliberate and Emergent Strategic Management Journal* 6:3, pp. 257-272.

Nelson, R. R. and Winter, S. G. (2002) Evolutionary Theorizing in Economics, *The Journal of Economic Perspectives* 16:2, pp. 23-46.

Nobelius, D., and Trygg, L. (2002) Stop chasing the Front End process — management of the early phases in product development projects. *International Journal of Project Management* 20:5, pp. 369-375.

O’Connor, G., Leifer, R., Paulson, A. and Peters, L. (2008) *Grabbing Lighting. Building a Capability for Breakthrough Innovation,* San Fransisco: John Wiley & Sons Inc.

Poskela, J., and Martinsou, M. (2009) Management Control and Strategic Renewal in the Front End of Innovation *The Journal of Product Innovation Management* 26:6, pp. 1161-1170.

Poskela, J., and Martinsou, M. (2011) Use of Evaluation Criteria and Innovation Performance in the Front End of Innovation *The Journal of Product Innovation Management* 28:6, pp. 896-914

Reid, E. and de Brentani, U. (2004) The fuzzy front end of new product development for discontinuous innovation: a theoretical model *The journal of product innovation management* 21:3, pp. 170-184.

Reid, E. and de Brentani, U. (2012) Market Vision and the Front End of NPD for Radical Innovation: The Impact of Moderating Effects *The journal of product innovation management* 29:1, pp. 124-139.

Ries, E (2011) The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses [online]. *Crown Business,* ISBN 978-0-307-88791-7.

Rietzchel E. F., Nijstad, B. A. and Stroebe, W. (2010) The selection of creative ideas after individual idea generation: Choosing between creativity and impact *British Journal of Psychology*, 101:1, pp. 47-68.

Rochford, L. (1991) Generating and Screening New Product Ideas *Industrial Marketing Management* 20:4, pp. 287-296

Rogers, E. M. (2003) Diffusion of innovations. New York: The Free Press.
Sarasvathy, S. D. (2001) Causation and Effectuation: Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency. *The Academy of Management Review* 26:2, pp. 243-263.

Sarasvathy, S. D. (2001) Causation and Effectuation: Toward a Theoretical Shift from Economic Inevitability to Entrepreneurial Contingency. *The Academy of Management Review* 26:2, pp. 243-263.

Sarasvathy, S. D., and Dew, N. (2005) New Market Creation Through Transformation. *Journal of evolutionary economics* 15:5, pp. 533-565.
Sull, D. (2004) Disciplined Entrepreneurship. *MIT Sloan Management Review* 46:1, pp. 71-77.

Saunders, M., Lewis, P. and Thornhill, A. (2012) *Research methods for business students,* Harlow: Pearson Education Limited.

Stevens, G. A. and Burley, J. (2003) Piloting the Rocket of Radical Innovation,
Research–Technology Management 46:2, pp. 16–25.

Sull, D. (2004) Disciplined Entrepreneurship. *MIT Sloan Management Review* 46:1, pp. 71-77.

Taheria, K. (2011) *Growing Ideas with Radical Innovation Potential,* M.Sc. Thesis, Gothenburg University, School of Business, Economics and Law.

Van de Ven, A. H. (1986) Central Problems in the Management of Innovation. *Management Science* 32:5, pp. 590-607.

Veeraraghavan, V. (2009) Entrepreneurship and Innovation. Asia-Pacific Business Review 5:1, pp. 14-20.

Volvo Group (2012) Annual Report 2012 Together We Move The World [online] Available at < http://www3.volvo.com/investors/finrep/ar12/ar_2012_eng.pdf> (Cited 2014-05-02)

Volvo Group (2013) Annual Report 2013 Extensive Product Renewal [online] Available at <http://www3.volvo.com/investors/finrep/ar13/ar_2013_eng.pdf> (Cited 2014-05-02).

Volvo Group (2014) A Global Group [online] Available at < http://www.volvogroup.com/group/global/en-gb/volvo%20group/Pages/aboutus.aspx> (Cited 2014-05-02).

Volvo Group Sverige (2013) Lediga Tjänster [online] Available at <http://www.volvogroup.com/group/sweden/sv-se/career/Lediga%20jobb/Pages/lediga_tjanster_us.aspx> [Search words: Front End Idea Screening for Radical Innovation] (Cited 2013-11-30).

Zahra, S. A. (2008) The virtuous cycle of discovery and creation of entrepreneurial opportunities. 2:3, pp. 243-257.

9 Appendices

9.1 Appendix I

9.1.1 Company interviews

Company	Type of interview	Date	Duration
Swisslog	Face-to-face	2014-04-03	56 min
Hype Softwaretechnik GmbH	Skype	2014-04-15	61 min
Alfa Laval	Skype	2014-04-17	57 min
AstraZeneca	Face-to-face	2014-04-28	62 min
Company X	Phone	2014-04-30	55 min
Company Y	Phone	2014-05-06	63 min

9.1.2 Expert interviews

Interviewee	Area of expertise	Type of interview	Date	Duration
Elerud-Tryde	Idea screening of innovation jams	Face-to-face	2014-03-21	60 min
Brasta	Marketing, communication and innovation management	Face-to-face	2014-04-04	53 min
Gartner Inc.	Consulting	Phone	2014-04-07	30 min
Bessant	Innovation and Entrepreneurship	Skype	2014-04-09	55 min
Expert A	Entrepreneurship, venture capitalism and innovation	Face-to-face	2014-04-10	63 min
Hedvall	Entrepreneurship	Face-to-face	2014-04-16	66 min
Wockatz	Strategic, intelligence and innovation work	Face-to-face	2014-04-24	64 min

9.2 Appendix II

9.2.1 Interview Guide Companies

Background info

1) What is your role?
2) What have you worked with before?

Questions

1) How do you organise the screening process for innovative ideas at your company?
    - As an iterative process or a one-of screening occasion?
    - Different processes depending on newness/uncertainty level?

- Different processes depending on market/technology driven?
- Different processes depending on geographical areas considered?

2) How do you as a company manage that people can be unmotivated to bring forward valuable ideas?

3) What corporate management support do you have in your process of screening innovative ideas?
- What would be ideal?

4) Who is involved in the screening process of innovative ideas? (What is their required knowledge and position? Groups or individuals? Same people throughout the screening process?)

5) What areas/criteria do you use when screening the innovative ideas? In what order are they used?

6) Do you adapt the areas/criteria to what type of innovation the idea regards (such as product, process, or services innovation), and/or the source of the idea (such as if it comes from customers, suppliers, employees, management)?
- If so, how do you do it?

7) Do you take your vision and strategic objectives into account in the screening process? If so, how?

8) How (or are you) incorporating/measuring different criteria's importance in the screening process?
- And, do you evaluate ideas and/or projects in relation to each other, or one by one.

9) What do you consider to be best practice regarding screening innovative ideas in large firms today?
- What companies are leading in this field?

10) What do you consider to be best practise regarding criteria that are used to evaluate ideas in entrepreneurial firms, and used by venture capital firms?
- Which are the most common criteria?

11) How does the 'final product' look like after an evaluation process is done?
- How would you prefer it to look?
- What needs to be included to get management attention?

12) Is there anything you believe that you are missing in your ways of working today, that you could learn from smaller firms?

13) Is there anything we have not asked you today that is of importance to know in order to understand your practises?
- Is there anything you would like to add about how this can be done better?

9.2.2 Interview Guide Experts

Process/Management level questions:

0) How do you define 'The Front-End of Innovation' and 'Screening'?

1) How should the selection process for innovative ideas be organised?

- As an iterative process or a one-of screening occasion?
- What should the development direction be if it is an iterative process?

2) How should companies manage that people can be unmotivated to bring forward valuable ideas? (As they might feel threatened by the outcome, or feel it jeopardises a promotion, their reputation, or business relationships.)

3) What corporate management support is needed for successful innovative idea screening?

4) Who should be involved in screening ideas? (Required knowledge and position? Groups or individuals? Same people throughout the screening process? From the BU the idea is related to?)

Regarding the selection criteria/grouping of ideas:

5) What areas/criteria should the ideas be screened against, and in what order?

- Should companies group ideas and then have different processes based on

-Technology push vs. market pull,

- Uncertainty level,
- Whether the idea is aligned with or outside the current strategy,
- Whether the idea fits the current situation or should be re-judged in the future.

6) Should the areas/criteria be adapted to what type of innovation the idea regards (such as product, process, or services innovation), and/or the source of the idea (such as if it comes from customers, suppliers, employees, management)?

- If so, how should this be done?

7) How should a company incorporate/measure different criteria's importance in the screening process?

- How would you define a 'high value idea'?

8) How/can a company's vision and strategic objectives be taken into account in the screening process?

9) When a firm has completed the screening process, what should have been completed/be known by then – how does a successful outcome look like?

-What should a 2-page document presented to higher management include for the final go/no-go decision?

10) What are the relevant questions to ask when examining a large company's current idea evaluation practises?

9.3 Appendix III

9.3.1 Methods mentioned by literature

Cooper (1988)	Koen *et al.* (2001)
First leave out obivous losers and misfits	New concept development:
must critera:	Leadership and culture
strategic aligment	environmental factors
feasibility	organisational capabilities
project size	business strategy
criteria specific to the firm	enabling science
	competitive landscape
should criteria:	outside world
market attractiveness	
synergy	Level of investment
fit with firm resources and experiences	technology and market risk
product advantage	organisational capabilities
profitability approximations	competition
	financial return
Preliminary assessment includes:	
market assessment	Lastly, a **business case** is developed, based on:
technical assessment	market potential
evaluation	customer needs
competition, growth, size and market segment, product acceptance and markting strategy	technology unknowns
technical staff assessment, technical viability,	project risks
	competitor assessment
Step 3	investment requirements
market activities to develop the concep, customers' ideal product,	
competitive analysis	
thereafter, developed into	

Martinsou and Poleska (2009: 2011)	Gaubinger and Rabl (2014)
target markets value propositions, product costs, and product functionalities are made at the screening stages	Should start with a very low degree of specification
Criteria usually regard areas of technology, risks, markets, strategy and resources	Should include critera about:
	technical feasibility
Ideas should be evaluated in relation to other ideas	prospective market success
customer needs	contribution for reaching the goal
technical feasbility	**Bessant *et a.l* (2010)**
strategic priorities	the strategic fit is used by firms to determine whether the idea should be part of existing business, a new business unit, or should be spun off
managers need to look at long term strategic opportunity and not only immediate attractiveness	score cards to weigh criterias' importance
Hart *et al.* (2003).	**Carbonell-Foulquié (2013)**
early screening:	technical feasibility
uniqueness of product	customer acceptance
intuition	strategic criteria
technical feasibility	
market potential	

Reitzschel *et al.* (2010)	Rochford (1991)
originality	**(Conf. Elerud-Tryde and Soonvald, 2011)**
feasibility	Criteria should be developed before ideas are generated
Newness level determines time and effort needed to gather the information	need to take into account the firm's NPD objectives
Rochford (1991)	process limitations such as time and budget
(Conf. Elerud-Tryde and Soonvald, 2011)	intially, simple criteria:
Compatibility of Fit with respect to:	Market
Organizational infrastructure	Size (current and potential)
Personnel and managerial expertise	Growth (current and potential)
i. Marketing	Appeal
ii. Sales	Role for the company
iii. Technical	Product
iv. Production	Uniqueness
v. Financial	Exclusivity (patentability)
vi. Customer/market needs	Feasibility
5. Time	Product development
Needed to develop the idea	Technology
Needed to commercialize	Production
Financial	Personnel
Investment requirements	Financial
Costs	Other
Profitability	Gut feel
	Is it realistic?
	Probability of success