MASTER

Innovation mediators and their influence on SMEs in collaborative forms of open innovation

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Innovation mediators and their influence on SMEs in collaborative forms of open innovation

by

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Executive Summary

Abstract

SMEs (small and medium-sized enterprises) take a special role in open innovation. While their resources are limited, SMEs are relatively very actively engaged in open innovation. There are, however, many barriers for them. This is especially true when looking at collaborative forms of open innovation. This study has researched the influence an innovation mediator can have on these collaborative forms of open innovation. It shows that SMEs can be motivated by a mediator more successfully when actively participating in collaborative forms of innovation by creating a trusted network, guiding the match making and selection procedure, guiding the alliances from the start up, and by reducing the workforce deficiencies through learning and knowledge sharing. A proposal of an innovation mediator’s framework based on these findings is presented that is based on enhancing active participation in the collaboration procedure for innovation mediators.

Introduction

Internal R&D was traditionally the focus for developing new products. However, labour mobility, the growing availability of venture capital, and the widely dispersed knowledge across multiple public and private organizations have changed the innovation climate in such a way, that the traditional focus has become expensive and slow by comparison (Chesbrough, 2003a). SMEs often lack the resources to singlehandedly scale their production, effectively market their products, and provide the necessary support services in a satisfactory manner. Therefore, collaborations with other, often larger, companies are necessary (Barney & Clark, 2007; Rothwell, 1991). Open innovation mediators act as a middleman to reduce the barriers and risks for organisations to participate in external networking and collaborative forms of innovation. They try to establish and maintain relationships with external entrepreneurs, users or scientists, in an open platform (Lopez-Vega & Vanhaverbeke, 2010). This study focuses on these mediators and their role in external networking and collaborative forms of innovation

Research Methodology

As open innovation is slowly becoming more commonly used, innovation mediators are becoming more involved for business to business based open innovation. Preliminary interviews suggest that these mediators may not be directly aware of their role as a mediator, and little is understood of what makes them work and what their core values are. This research covers a focus group meeting of 10 SME
representatives and the SME account manager of an innovation mediator as well several interviews with
the Operational Program Manager of the innovation mediator; ISPT. These interviews and the focus
group meeting have been based on an extensive literature review. From the focus group and the
literature some key parameters have been proposed (design parameters) that have been used to create
three design aspects. The parameters have created using the barriers and success factors a SMEs might
encounter when participating in collaborative forms of open innovation. The design aspects have been
created by prioritizing the barriers and success factors that have the highest impact. Finally, a conceptual
framework has been drafted, based on the design aspects. This framework describes the key activities
and support actions (direct and indirect) for a mediator.

Design

The goal of the research is to provide insight and create the proper tools, in the form of a conceptual
framework, for open innovation mediators to promote collaborative forms of innovation by decreasing
the barriers to participate, enhance the incentives, and enhancing the critical success factors for their
participants. The design for the conceptual framework is an integrated design created from 3 design
aspects. These design aspects were created by using the literature and cross referencing this with a focus
group of SMEs that are engaged with an innovation mediator. The created design is based on 3
principles:

1. **The mediator as a selection tool and match maker**

   SME’s have lesser resources and in the form of time and funds. An Innovation Mediator should
therefore actively try to reduce the time invested by an SME in order to find a suitable project. A
mediator should be a guide in starting a SME, project, and how to obtain subsidy. The network of a
mediator, knowing, and being able to collaborate with, a variety of institutes, companies and
government agencies will create more opportunities to match companies and institutes together. A
network within the government agencies will create shortcuts to subsidies. The engagement with a
mediator should provide a reference point for other organisations in whether an organisation is
trustworthy. By being selective in what institutes a mediator affiliates with, by selecting only those
enterprises that can be trusted, either through past experience through working with the mediator, the
experience of other key partners of the mediator or general reputation, can a mediator become a
reference point if companies can be trusted.
2. **The mediator as innovation and collaboration coach**

Supporting organisations by providing coaching on organizational issues, and advice on patent policy, creates a basis of collaboration and trust. A mediator fills the role of innovation and collaboration coach guidance and support for partners at start, during and the ending of the project. The aim is to reduce the barriers posed by regulations and the market, reducing organizational culture / social capital barriers and reducing technological risks while directly and indirectly aligning the alliance objectives and enhancing sharing and capacity to reduce the lack of resources and costs.

3. **The mediator as stimulator for knowledge and learning**

Continuous learning ensures rapid adaptation to the changes in regulations affecting the open innovation agreements and a faster orientation towards sources of financing. Furthermore, by gaining more knowledge, SMEs are better able to protect their intellectual property and to reap the rewards from partnering for innovation purposes (Coraş & Tanţău, 2013). Since the gain of knowledge is also one of the stronger incentives to adopt open innovation practices (Van de Vrande et al., 2009), an innovation mediator could help to not only to directly helping in the collaboration process but also by enhancing the workforce. The integration of the design aspects resulted in the conceptual framework presented in Figure 0-1.
Conclusion

When looking at direct support, a mediator can, by actively enhancing the Network Database provide SMEs with a large network of technology suppliers and extensive knowledge about the market and technology. In the Network Construction, the mediator can help reducing the effort to find partners and provide assistance by guiding collaborations during the start of the alliances, thus increasing the chances of success and decreasing collaboration and social capital barriers. Network Management can help in reducing technology and collaboration risks with regard to patents by being a middleman, and provide advice on funding, general management, taxes, laws, etc.
# Table of Contents

Executive Summary ................................................................................................. 1

Abstract ................................................................................................................... 1

Introduction ............................................................................................................. 1

Research Methodology .......................................................................................... 1

Design ...................................................................................................................... 2

Conclusion .............................................................................................................. 4

1. Introduction ........................................................................................................ 7
   1.1 Problem statement ......................................................................................... 8
   1.2 Goal ............................................................................................................... 8
   1.3 Research scope ............................................................................................ 9
   1.4 Research questions ..................................................................................... 9
   1.5 The added value .......................................................................................... 12

2. Theoretical background ..................................................................................... 12
   2.1 Introduction ................................................................................................ 12
   2.2 The emergence of open innovation ............................................................ 13
   2.3 Classification of openness ........................................................................ 17
   2.4 Dimensions of open innovation ................................................................ 18
   2.5 SMEs and open innovation ....................................................................... 20
      2.5.1 Collaborating SMEs ........................................................................... 20
   2.6 Incentives and success factors ................................................................... 22
      2.6.1 Motives to adopt open innovation ....................................................... 23
      2.6.2 SME specific gains ............................................................................ 24
      2.6.3 Success Factors .................................................................................. 25
   2.7 Barriers ........................................................................................................ 28
      2.7.1 Adoption Challenges .......................................................................... 28
      2.7.2 Barriers for SMEs ............................................................................. 29
      2.7.3 Barriers SMEs compared to large firms ............................................ 31
   2.8 Open innovation intermediaries ................................................................. 33
      2.8.1 Conceptual framework Intermediary .................................................. 33
      2.8.2 Innovation intermediary typology ...................................................... 34

3. Research Method ............................................................................................... 36
1. Introduction

Internal R&D was traditionally the focus for developing new products. However, labour mobility, the growing availability of venture capital and the widely dispersed knowledge across multiple public and private organizations have changed the innovation climate in such a way, that the traditional focus has become expensive and slow by comparison (Chesbrough, 2003a). Large firms with high investment capabilities and complementary assets can no longer depend on being the first to create the best and the greatest number of ideas. Product life cycles have declined, resulting in that even though the costs increase to develop a product, the revenue decreased because the product has less time on the market, as can be seen in, figure 2-1 (Chesbrough, 2007). This can be countered by finding new and creative ways to fully exploit the technology created by allowing inside intellectual property to be commercialized externally. Furthermore, development costs can be decreased by using outside ideas and technologies in internal product development, Figure 2- (Chesbrough, 2007). Open business models cut costs and time from leveraging external development while creating more revenue by allowing their inside intellectual property to be commercialized externally (Chesbrough, 2003a ; Chesbrough, 2007 ; Van de Vrande, De Jong, Vanhaverbeke & De Rochemont, 2009).

When looking at SMEs (small and medium-sized enterprises) with regard to innovation, they often lack the resources to singlehandedly scale their production, effectively market their products, and provide the necessary support services in a satisfactory manner when trying to introduce a new product. Therefore, collaborations with other, often larger, companies are necessary. Large enterprises use these collaborations in order to gain the flexibility and innovativeness of SMEs, while providing their resources as complementary assets to attract them. This gives SME’s the opportunity to develop ideas and inventions into products and processes (Barney & Clark, 2007; Rothwell, 1991).

The term open innovation was first promoted by Henry Chesbrough and defined as: “(...) a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology” (Chesbrough, 2003b; Chesbrough, 2006). The use of internal and external paths to market and ideas is realized by utilizing and combining technology acquisition and technology exploitation, which is both outside-in and inside-out movements of technologies and ideas (Lichtenthaler, 2007). This is in contrast with the traditional closed innovation model, based on self-reliance in which a company depends on the generation, development and commercialization of its own ideas.

Open innovation is becoming popular, and this trend is not limited to just some industries (Vossen, 1998 ; Van de Vrande et al., 2009). There are, however, many barriers to overcome before one can fully
adopt open innovation within an organisation. Some of these boundaries are directly related to open innovation, while others relate to the collaborative parts of open innovation. One adoption challenge for open innovation is that it requires sustained internal commitment over sufficient time, before the benefits can be realized (Chesbrough & Crowther, 2006). Collaboration barriers can range from the quality of the partners, organisational problems, lack of resources or even deficiencies in the organisation’s own workforce.

Open innovation mediators act as a middleman who can help reduce the barriers and risks for organisations to participate in external networking and collaborative forms of innovation. This research focuses on these mediators and their role in external networking and collaborative forms of innovation. Innovation mediators establish and try to maintain relationships with external entrepreneurs, users or scientists, in an open platform (Lopez-Vega & Vanhaverbeke, 2010). The current research examines how these mediators can create an environment that invites to openly participate in these forms of innovation, by reducing barriers and enhancing the chances for a successful collaboration.

1.1 Problem statement

Open innovation is becoming a necessity for SMEs to develop innovation, scale their production, effectively market their products, and provide the necessary support services. However, many SME’s are having difficulties codifying and transferring knowledge (Kogut & Zander, 1993), or have reservations with regard to collaboration due to a lack of trust, the complexity or other barriers. Therefore, SMEs often still decide it is better to develop and exploit knowledge in-house rather than licensing, or buying it from, or selling it to innovation partners. Innovation intermediaries may help alleviating these problems (Lopez-Vega & Vanhaverbeke, 2010). However, for an SME to collaborate with an innovation intermediary, the innovation intermediary needs to definition of what the barriers are, for SMEs to collaborate in open innovation, how to mitigate them and what the success factors are for collaborations, and how to enhance these. This thesis aims to provide an answer to these questions and provide a framework on which a mediator can base their business model.

1.2 Goal

The goal of the research is to provide insight and create the proper tools, in the form of a conceptual framework and design aspects, for open innovation mediators to promote collaborative forms of innovation by decreasing the barriers to participate, enhancing the incentives, and enhancing the critical success factors for their participants.
1.3 Research scope

As open innovation is slowly becoming more commonly used, innovation mediators are becoming more involved for business to business based open innovation. Preliminary interviews suggest that these mediators may not be directly aware of their role as a mediator, and little is understood of what makes them work and what their core values are. This research covers an extensive focus group meeting of 10 SME representatives and the SME Account Manager as well several interviews with the Operational Program Manager of the innovation mediator ISPT. Since a mediator’s influence can only reach so far, the focus will be on the individuals that represent the organisation towards a mediator. These interviews and the focus group meeting will be based on an extensive literature review.

1.4 Research questions

*How can representatives from SMEs be influenced by mediators to become willing to actively participate in collaborative forms of innovation?*

The central research question will be elaborated with several preliminary questions. In preparation of answering the central question, these questions must be answered. First we will look at reasons not to commit to open innovation. The barriers for open innovation will provide insight into what may prohibit a SME to adopt collaborative forms of open innovation.

*RQ1: What are the barriers and adoption challenges for open innovation?*

It must also be established if the opinions of these representatives actually reflect the opinions of senior management and therefore the directions the company takes, and has taken, with regard to open innovation. Even though it is expected that senior management in SME’s are directly involved, it should not be assumed. Therefore the following research question must be answered:

*RQ2: Does the opinion of the representatives correctly represent and influence the actions taken by senior management?*
Joining and doing projects with the mediator may change the opinion of the representatives of collaboration and open innovation. To ensure that collaborations do not stop prematurely after being constructed, it must be established how the mediator can enhance the effort throughout the collaboration and after. Furthermore, if an organisation is in between projects, this may change the opinion of the representatives about open innovation and collaboration. This leads to the following research question:

**RQ3: How can the collaboration with the mediator enhance the company representatives’ opinion about collaborative forms of innovation?**

*During* - the time from first conversation to joining
- when participating in a project
- when not participating in a project

In order to motivate SMEs to engage in open innovation, first the incentives must be defined. By enhancing the incentives, and reducing the barriers from research question 1, SMEs will be more likely to engage in collaborative form of innovation.

**RQ4: What motivates representatives of SMEs to engage in collaborative forms of innovation?**

Finally, the information provided by these four research questions will be used to create a model for mediators. Because in order for a mediator to maintain relationships with an organisation, and make sure they actively participate, they must know how to influence and motivate their representatives. An organisation will not immediately gain results from the implementation and being actively involved in open innovation. An open innovation champion, as described in Chesbrough and Crowther (2006) in the form of the representative is needed to maintain participation in these collaborative forms of innovation. If the mediator knows what ultimately retains or drives organisations away, they know where their focus should be. This translates into the following research question:

**RQ5: How can a mediator motivate the representatives to become so called “innovation champions”?’**
These research questions will, when answered, provide the information necessary to provide an answer the problem statement. Furthermore, they will be a guideline throughout the research. As can be seen in figure 1-1, the literature review will be used to find the incentives, success factors and barriers which are used to create the design parameters. The focus group will be used to provide insight into some of the incentives, success factors and barriers the group perceives, but also to reveal any other design parameters by elaborating on the key activities and resources of a mediator. The design parameters will then lead to the conceptual framework that will provide an answer to the main research question. The actions in the left part of figure 1-1 correspond with the location in the thesis, presented on the right. So, for example, the focus group is green because it part of the analysis, and the main research question is in red, for it is integrated in the design part of the thesis.

Figure 1-1: Research model
1.5 The added value

The research tries to understand the motivation behind open innovation for SME’s. Through an organisation that actively tries to reduce barriers and create incentives to engage in open innovation, combined with a literature study, this study tries to understand what the perceived dangers are, and the goals of their participants. This study tries to provide new insights in cooperation and trust issues. While current findings on open innovation are mostly theoretical, this research is an opportunity to provide practical and relevant solutions for these issues, provided by and for, those that are currently innovating openly. The thesis concludes in a design in the form of a framework and several design aspects. This design should provide a clear indication for direction and activities mediators should take.

2. Theoretical background

In this section, the theoretical background will be explored. The literature in this section will provide the backbone of the design. First, the general introduction will be given to introduce the concept of open innovation, and then the emergence of the open business model will be presented. This is followed by a classification of the different dimensions of open innovation, including collaborative forms of open innovation. Then the role of SMEs in open innovation will be introduced. The effect of open innovation for SMEs will be elaborated upon with the barriers, incentives and success factors of both collaboration and open innovation. The theoretical background will continue with the introduction of open innovation intermediaries and their roles in open innovation, and will conclude with a conceptual framework to describe their main activities, concluding with a classification of the different types of intermediaries.

2.1 Introduction

The term open innovation was first introduced by Henry Chesbrough and defined as: “(...) a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology” (Chesbrough, 2003b) (Chesbrough et al., 2006). Open innovation processes combine internal and external paths to market, by utilizing and combining technology acquisition and technology exploitation, which includes both outside-in and inside-out movements of technologies and ideas (Lichtenthaler, 2007). This is in contrast with the traditional closed innovation model, based on self-reliance, in which a company depends on the generation, development and commercialization of its own ideas.
Internal R&D was traditionally the focus for developing new products. For many industries this meant that the larger firms with high internal R&D investments, capabilities and complementary assets could outperform their smaller competitors. Consequentially they were able to discover the best and the greatest number of ideas first. This combined with a firm grip on their intellectual property (IP), presented a considerable barrier for potential rivals (Chesbrough, 2003a; Van de Vrande et al., 2009). By reinvesting the profits into R&D, this cycle could be maintained (Chesbrough, 2003b).

This cycle worked at the time, in the 20th century. However, there came several changes in the innovation landscape. Labour mobility, the growing availability of venture capital, which helped finance new firms, and the widely dispersed knowledge across multiple public and private organizations made large organizations unable to afford to innovate on their own. Now, the scientists and engineers who help facilitate a breakthrough have options outside of the organisation if the company that funded the discovery does not pursue it in a timely fashion. The financing could come from venture capital, and later through a stock offering. Furthermore, when a start-up becomes successful, it will not have to reinvest in new breakthrough or fundamental innovations. This start-up will generally look outside of their own organisation for another technology to commercialize, thus breaking the virtuous circle of closed innovation (Chesbrough, 2003a; Chesbrough, 2007).

2.2 The emergence of open innovation

A growing amount of large, high-tech multinational enterprises (MNEs) have responded by adopting open innovation into their business models. These are so called open business models, in which both internal and external pathways are used to exploit technologies and to acquire knowledge from external sources (Chesbrough, 2007). An example used by Chesbrough (2003) was the difference between Cisco Systems and Lucent Technologies. Lucent had inherited most of Bell Laboratories after AT&T broke up. For Lucent, this meant that they had very strong R&D capabilities. This in contrast with Cisco, who did not even come close to the R&D capabilities Lucent had. However, Cisco acquired their knowledge from the outside, usually by partnering or investing in promising start-ups. This resulted in that, even though Lucent invested strongly into their internal R&D, Cisco could keep up with Lucent and even beat them to the market. This is one of more examples of companies keeping up with developments without having a particularly strong in-house R&D.
The principles of open and closed innovation as defined by Chesbrough (2003a) are described in Table 2-1 along with the different business models companies have adopted. What can be seen in this table is that the difference between open and closed is a realization not all innovations have to, or even can be done in-house to profit from it. To profit from R&D in a closed innovation model a business aims to discover, develop and ship it themselves, discover it first to get it to the market first and be the first to commercialize an innovation. This strategy became more and more ineffective. The development costs were rising while the product life cycles were declining. This resulted in that even though the costs increased to develop a product, the revenues decrease because the product has had less time on the market, as can be seen in figure 2-1 (Chesbrough, 2007).

In figure 2-1, the left bar shows that the expected revenues exceeded the expected development costs. However, when development costs rise and product life cycles become shorter, the net result becomes lower, as can be seen in the right bar. The result is that companies find it harder earn back their innovation investment (Chesbrough, 2007). This could be countered by finding new and creative ways to fully exploit the technology created, done by allowing inside intellectual property to be commercialized externally. Development costs can be decreased by using outside ideas and technologies in internal product development (Chesbrough, 2007). When comparing this to their open innovation counterparts depicted in table 2-1, one can see that external R&D can create value and internal R&D is used to claim a portion of it. Therefore, an origination no longer has to be the original source of the research to profit from it.

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

Table 2-1: Closed innovation principles vs open innovation principles (Chesbrough, 2003a).
What this means for the total revenue from a product compared to the old model is depicted in figure 2-2. New revenues are created in the form of sale/divest of R&D, spinoffs and licensing certain innovations. Costs are decreased by leveraging external development (Chesbrough, 2007). The rising development costs combined with shorter product life cycles (left bar) results in that companies need new and creative ways fully exploit their technology by allowing inside intellectual property to be commercialized externally. Furthermore, development costs can be decreased by using outside ideas and technologies in internal product development (Chesbrough H., 2007).

The new model can be seen in Figure 2-1. The ‘funnel’ that can be seen here represents the borders a closed innovation model is confined by the current market and business model for the firm. Bad ideas that initially look promising in an open and closed innovation model will be weeded out, narrowing the funnel of R&D projects that make onto the current market. The main difference is that open innovation also incorporates the ability to create value from projects that lack promise for this firm by licensing these ideas out, or, in a later stage of development, by using these ideas by tapping into a new market and creating a new business model for the firm. This is depicted in figure 2-3 by the arrows going out of the funnel. Table 2-1 also shows the use of internal and external idea’s and buying others’ IP whenever it
advances your own business model in open innovation, depicted in Figure 2-1 by the arrows going into the funnel. Some bad ideas for the current market and business model may be “saved” by using these external ideas from licensing-in, outsourcing-in, or partnership networking. R&D projects that may have been declared dead otherwise, can still create value by introducing external IP.

Open business models do not just cut cost and time from leveraging external development, but companies with open business models also allow inside intellectual property to be commercialized externally creating more revenue. This is done through licensing fees, joint ventures and spinoffs. This way a company can create revenue in markets they themselves are not active in, thus creating more overall revenue from the innovation (Chesbrough, 2007). These open innovation practices encompass several dimensions which are further explained in chapter 2.4.
2.3 Classification of openness

In contrast to what may be suggested by the table presented by Chesbrough (2003a), open innovation is not a dichotomous open and closed system, but rather continuous with varying degrees of openness (Chesbrough H. , 2003b; Dahlander & Gann, 2010). Open innovation encompasses many practices and dimensions and these dimensions can be somewhat open and closed. The measurement of open innovation should therefore be in a scale that reflects this multidimensional nature and thus allow the dimensions to not be (fully) correlated (Gassmann & Enkel, 2004; Huizingh, 2011; van de Vrande et al., 2009). There have been several of these scales suggested in past literature. For example, Dahlander and Gann (2010) use inbound and open innovation vs pecuniary and non-pecuniary, as can be seen in appendix Table A-1. This model is made as a basic starting point for empirical research. However, the four cells in the matrix labelled as acquiring, selling, sourcing, and revealing, give a good basic understanding for different organisations to understand the activities compromising each of these four strategies and their effectiveness in different contexts and organisations.

<table>
<thead>
<tr>
<th>Innovation process:</th>
<th>Innovation outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>Closed</td>
</tr>
<tr>
<td>Open</td>
<td>Open</td>
</tr>
</tbody>
</table>

Table 2-2 Classifications of openness (Huizingh, 2011)

Another example of an attempt to classify the multidimensional nature of open innovation is presented in table 2-2. In contrast to Table 2-1, table 2-2 keeps room for public innovation and private open innovation which are somewhere between open and closed. Closed innovation is described here as a situation in which a proprietary innovation is developed in-house. In private open innovation, the innovation process is opened up by using external R&D through partners or externally exploiting an internally developed innovation. The outcome, however, is closed making it a proprietary innovation. The third represents an innovation in which the innovation process is closed, but the results are open and available for others, a public innovation. This occurs when, for example, a company does not exclude others from using an innovation in order to create a market standard. The fourth, open source innovation, is an innovation in which both the process and results are open (Huizingh, 2011). As these classifications may suggest, open innovation encompasses several activities and dimensions. These dimensions will be introduced next.
2.4 Dimensions of open innovation

As suggested when classifying the openness of innovation, open innovation in practice encompasses many dimensions. In Table 2-3 these dimensions are presented as defined by van de Vrande et al. (2009). The main distinction between the open innovation processes is between technology exploitation, from inside to outside, and technology exploration, from outside to inside the company. Some of these practices will be elaborated upon.

Three technology exploitation practices, when engaging in open innovation, are distinguished. These practices can help firms to better profit from internally created knowledge. Venturing is used when the knowledge that is created falls outside of the firm’s current market and business model. A new organisation is therefore started based on this knowledge, while still being able to draw upon the resources of the original firm. Outward IP licensing is used when internal knowledge is created that falls outside of the firm’s current market and business model, and venturing may not be desirable. This decision is based on the anticipated revenues and profit-dissipation effects. This because outward licensing create value, but when the licensees use this technology to compete in the same market it may decrease current profits. The knowledge will be sold in various forms, in order to create profit from innovations that may not have any direct significant value for the organisation.

When a firm externally acquires new knowledge and technologies, it falls under technology exploration. External networking requires acquiring and maintaining connection with external sources of social capital. This social capital includes both individuals, for example certain experts, and organisations. These networks can be used to fill certain knowledge gaps within a firm in a relative short time, compared to investing in developing the knowledge internally. The networks may also involve formal collaborative efforts such as R&D alliances. External participations enable the recovery of innovations that were initially abandoned. Firms may use equity investments in new or established enterprises to keep an eye on potential opportunities for further external collaboration.
When looking at SMEs, outward and inward IP licensing, venturing activities and external participations are only practiced by a minority of the firms. However, open innovation practices that do not require substantial investments, like customer involvement and external networking, have proven to be more popular (van de Vrande et al., 2009; Vossen, 1998). Overall, there several different open innovation practices. Though some may only require incremental changes to an organization’s business model, others may prove to be more challenging to adopt. The focus in this study will be on SMEs and the collaborative forms of open innovation.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology exploitation</strong></td>
<td></td>
</tr>
<tr>
<td>Venturing</td>
<td>Starting up new organizations drawing on internal knowledge, and possibly also with finance, human capital and other support services from your enterprise.</td>
</tr>
<tr>
<td>Outward IP licensing</td>
<td>Selling or offering licenses or royalty agreements to other organizations to better profit from your intellectual property, such as patents, copyrights or trademarks.</td>
</tr>
<tr>
<td>Employee involvement</td>
<td>Leveraging the knowledge and initiatives of employees who are not involved in R&amp;D, for example by taking up suggestions, exempting them to implement ideas, or creating autonomous teams to realize innovations.</td>
</tr>
<tr>
<td><strong>Technology exploration</strong></td>
<td></td>
</tr>
<tr>
<td>Customer involvement</td>
<td>Directly involving customers in your innovation processes, for example by active market research to check their needs, or by developing products based on customers’ specifications or modifications of products similar like yours.</td>
</tr>
<tr>
<td>External networking</td>
<td>Drawing on or collaborating with external network partners to support innovation processes, for example for external knowledge or human capital.</td>
</tr>
<tr>
<td>External participation</td>
<td>Equity investments in new or established enterprises in order to gain access to their knowledge or to obtain others synergies.</td>
</tr>
<tr>
<td>Outsourcing R&amp;D</td>
<td>Buying R&amp;D services from other organizations, such as universities, public research organizations, commercial engineers or suppliers</td>
</tr>
<tr>
<td>Inward IP licensing</td>
<td>Buying or using intellectual property, such as patents, copyrights or trademarks, of other organizations to benefit from external knowledge.</td>
</tr>
</tbody>
</table>

Table 2-3: Open innovation practices as described by van der Vrande et al (2009).
2.5 SMEs and open innovation

Open innovation practices in SMEs differ from large enterprises. SMEs have fewer resources to engage in open innovation practices. While this is considered a barrier to engage in open innovation, it also cited as a motive for looking beyond organisational boundaries for technological knowledge. SMEs view networking and cooperation as ways to broaden their technical competences (Edwards, Delbridge, & Munday, 2005). However, SMEs often have insufficient technological assets and expertise to be of interest to universities and public research centres (Narula, 2004).

Literature gives two different answers to whether SME are more effective than large firms when it comes to introducing product or service innovations. SMEs are deemed more effective because they can respond better to the market needs (Dahl & Moreau 2002), they have less bureaucracy (Cassiman & Veugelers, 2006), and more organisational flexibility (Sivadas and Dwyer 2000). However, the SMEs also have to deal with limited resources and constrained innovation capabilities. Due to their limited resources, SMEs have a strong incentive to search for alternative options to generate economies of scale, ensure the provision of support services, reduce risk, and increase operational flexibility and to market their products. SMEs do have an advantage over large firms in that they have a superior ability to use external networks.

Overall, SMEs depend more on open innovation than large enterprises. Large enterprises do, when looking at sheer numbers, more open innovation activities. However, SMEs have a much higher intensity, which is the ratio of open innovation activities over employment, of open innovation activities.

2.5.1. Collaborating SMEs

Since SME’s often lack the resources to singlehandedly scale their production, effectively market their products, and provide the necessary support services all in a satisfactory manner, collaborations with other companies may be necessary. Large enterprises often benefit from the flexibility and innovativeness of SME’s by collaborating with them, using their resources as complementary assets to attract them. Thus giving these SME’s the opportunity to develop ideas and inventions into products and processes. SME’s are, however, more likely to make external networks with other SME’s and institutions (Barney & Clark, 2007; Rothwell, 1991), than large enterprises.
Several collaboration modes have been proposed, in Table 2-4 they are classified by relations between the actors and distinguished between exploration and exploitation as presented by Lee et al (2010). From this table, the most dominant collaboration models for SMEs have been defined in Figure 2-2. What can be seen is that in the exploration phase, SME’s attract a combination of external partnerships with others SME”s, universities and research centres, large firms, and non-profit research centres in order to concentrate their effort on retaining high levels of internal competence in a limited number of technology areas (Narula, 2004). Universities and public research institutes are preferred, this due to fears of giving certain critical technologies away to competitors (Tidd & Trewhella, 1997).

In the exploitation stage, value is created through supplier/customer relations with large firms, (Luukonen, 2005), and outsourcing agreements or strategic alliances and partnerships with other SMEs (Edwards et al., 2005). While alliances with large firm can give many benefits in the form of resources; SMEs may be forced into sharing their technological competence with this large firm. This negates the advantage the SME has, their technological competence, while increasing the flexibility of the large firm resulting in that the SME no longer has the opportunities to compete with the large firm (Narula, 2002).

Another possible model for SMEs is a network of SMEs. SMEs often specialise in a certain specific area. A network of SMEs creates an opening to enter wider markets while acquiring complementary resources, and increasing core competencies to improve a SMEs chances of competing against larger competitors. This is particularly helpful for start-ups for it helps to share risks and profits while helping to develop further business opportunities (Lee, Park, Yoon & Park, 2010).

<table>
<thead>
<tr>
<th>Mode</th>
<th>Exploration</th>
<th>Exploitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer-provider</td>
<td>Funding, licensing, outsourcing, etc.</td>
<td>Outsourcing, etc.</td>
</tr>
<tr>
<td>Strategic alliance</td>
<td>R&amp;D partnership, joint-ventures, etc.</td>
<td>Partnership, etc.</td>
</tr>
<tr>
<td>Inter-firm alliance</td>
<td>Network, etc.</td>
<td>Network, etc.</td>
</tr>
</tbody>
</table>

Table 2-4 Possible collaboration modes in a value network (Lee et al., 2010).
Concluding, SMEs depend more on open innovation than large enterprises. Though their lack of resources, technological assets and expertise may prohibit them to engage in open innovation practices, it is also an incentive, looking beyond organisational boundaries for technological knowledge. Open innovation is more important for SMEs than for large firms. Furthermore, SMEs are prone to use different sets of open innovation practices to realise OI benefits. Though collaborations with other companies may be necessary for many open innovation practises, there are often many barriers for SMEs to overcome before they are willing to cooperate. These barriers are not limited to collaborative forms of open innovation, and will be discussed further.

2.6 Incentives and success factors

Here will the incentives for SMEs the engage in adopt open innovation are discussed as well as the success factors for collaboration, looking mainly at collaborative forms of open innovation. There are also differences in the gains of SMEs compared to large firms, which will also be discussed. The findings are summarized at the end of the chapter in table 2-5, together with a short description and their sources.
2.6.1. Motives to adopt open innovation

The different innovation practices seem to have the same underlying motives according to van de Vrande et al. (2009). Implying that venturing, participation in other firms, inter-organizational networks and customer involvement are complementary innovation activities in improving product development, integrating new technologies and keeping up with current market developments.

Market-related motives

According to the research by van de Vrande et al. (2009), the most important determinant for SMEs to engage to pursue almost all open innovation practices, but mainly venturing, participating in other firms and involving users in the innovation process, are market related motives. It is deemed a necessity by SMEs to use a broad set of methods if they want to meet the ever-changing customer demand and to prevent being outperformed by competitors or new entrants. Using new innovation methods is regarded as a way to keep up with market developments, resulting in increased growth, better financial results, or increased market share (van de Vrande et al., 2009).

Innovation process

The innovation process motives are present in almost all forms of open innovation (with the exception of employee involvement). Organizations can innovate their innovation processes to reduce time-to-market and to better utilize internal creativity (Jacobs & Waalkens, 2001). This therefore includes improved product development, process-/market innovation and the integration of new technologies. These incentives are mainly present with open innovation practices that include venturing and with external networking and external participation.

Learning and knowledge gain

The gain of external knowledge is mainly an important motive for external networking and for outsourcing R&D. The main motive behind this is bringing expertise to the firm.

Cost reduction

Cost management and the potential increase in capacity are minor motives to adopt open innovation practices. As may be expected, these motives are mainly present in external networking, external participation and outsourcing R&D. Cost management, the increase of profitability and efficiency, however, seems to be only a minor incentive. (Coraş & Tanţăuş, 2013; van de Vrande et al., 2009)
Risk sharing and capacity

Distributing the risks among the participant reduces the costs of the consequences of an unsuccessful innovation attempt (Coraş & Tanţău, 2013). Another incentive related to sharing and capacity is that SMEs are often unable to innovate on their own. Open innovation is therefore used as a counterbalance for their lack of capacity (van de Vrande et al., 2009).

Concluding, the main motives behind adopting open innovation by SMEs are market related. This corresponds with the research by Chesbrough (2003a; 2007) that stated that open innovation started as a response to the large firms that heavily invested in R&D in a closed innovation model. Innovating the innovation processes to reduce time-to-market and to better utilize internal creativity and enhanced learning are important incentives to learning and improving through collaborations. Finally, to overcome lack of resources SMEs may encounter, collaborations can reduce costs and the sharing of risks and the capacity can help SMEs participate in, and gain from, innovation projects that may not have been possible to achieve alone.

2.6.2. SME specific gains

When looking at the gains for SMEs for open innovation, it has been found that open innovation has a positive effect on the introduction of new offerings of SMEs. This is also the case for large companies, but the difference resides in that, although SMEs are less effective than large enterprises in generating new products and services through open innovation, they do experience a more substantial effect from the sales of new products/services generated through open innovation (Spithoven, Vanhaverbeke, & Roijakkers, 2013).

When focusing on the collaborative forms of open innovation, there are two gains that distinct SMEs from large enterprises. First, SMEs can foster the introduction of new offerings through collaboration with several innovation partners. Collaborative forms of open innovation increases the likelihood that an SME launches new products and services while this is not the case for larger companies (Spithoven et al, 2013).

The second gain, in contrast to large enterprises, is that SMEs can also increase their share of new products or services in total turnover through IP-protection. While large companies often patent all inventions, regardless if they become a market success or not, SMEs only patent innovations that have a strong expected market potential. Furthermore, large companies often use IP as bargaining chips for cross-licensing deals with other firms. This results in that IP in a large firm seems not to function in the first place as a means to enlarge the share of new products and services in total turnover, while SME
usually don’t sell their technology but do try to enlarge the share of new products and services (Spithoven et al, 2013).

In general, it can be concluded that open innovation is more important for SMEs than for large firms and that SMEs are prone to use different sets of open innovation practices to realise open innovation benefits than large enterprises (Spithoven et al, 2013).

2.6.3. Success Factors

Though some of the incentives and adoption motives for adopting open innovation practices discussed coincide with collaborative forms of open innovation, it may also be helpful to discuss the factors that may help collaborations become a success. Hoffmann and Schlosser (2001) studied strategic alliances with the aim to identify the critical success factors, when looking at SME’s. The main difference between success factors and critical success factors, as the name might suggest, is that while success factors may be of some influence to the success of the collaboration, the critical success factors can mean the difference between success and failure. The most important critical success factors related to collaborative forms of open innovation are discussed here.

_Precise definition of rights and duties_

The success of an alliance, in part, depends on whether it can be configured to minimise behavioural uncertainty and the resulting need for control. If behavioural uncertainty is high, this increases control costs, which in turn reduces the efficiency of the alliance. When there are disputes about input in the co-operation (duties) and sharing the output (rights) this causes high costs for conflict resolution. By establishing precise targets and task definitions potential conflicts can be avoided (Hoffmann & Schlosser, 2010).

_Contributing specific strengths and looking for complementary resources_

A company should look for alliance partners must have some form of excess resources to offer and seek complementary or similar resources for transferring or pooling. Therefore, a company seeking a successful alliance must contribute individual strengths and look for complementary, or similar, resources (Hoffmann & Schlosser, 2010).

_Establishing required resources_

Once the parties have agreed to co-operate, and the basic objectives are agreed upon, the partners must agree on whether the input factors remain the property of each player or if they become mutually shared. This primarily included the tangible and intangible assets employees and financial funds that that they agreed are required (Hoffmann & Schlosser, 2010).
**Deriving alliance objectives from business strategy**

Companies view alliances as instrument to implement strategies and achieve strategic goals. The planning for deciding to cooperate should therefore be derived of the business strategies of the companies involved. This analysis should evaluate if and how an alliance can improve the company’s strategic position in their particular business (Hoffmann & Schlosser, 2010).

**Speedy implementation and fast results**

Quick and measurable results from the groundwork are also important for a successful co-operation. Early success can strengthen the alliance management and convince sceptics. This can be done by, after the basic rules and framework for the partnership have been agreed upon, starting an initial common project or task so the partners get used to working with each other and see the alliance become a reality (Hoffmann & Schlosser, 2010).

There are many success factors which may contribute to a successful alliance. However, by definition, “critical” factors of success are those that determine the success or failure of an alliance. The research found that the critical success factors for SMEs are concentrated in the early stages of alliance evolution. Therefore, systematic preparation and careful planning are very important for alliance success. Precise definitions of the roles, ownerships of resources objectives help reduce uncertainties and can avoid potential conflicts. Starting projects early on can the partners get used to working with each other and see the alliance become a reality (Hoffmann & Schlosser, 2010). The success factors are summarized in table 2-5.
<table>
<thead>
<tr>
<th>Success factors</th>
<th>Definition</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market</td>
<td>Keep up with current market developments, customers, increase growth and/or market share</td>
<td>(4), (5)</td>
</tr>
<tr>
<td>New offerings</td>
<td>Positive effect on the introduction of new offerings, positive effect on the sales of new products/services, increased likelihood launching new products and services</td>
<td>(4)</td>
</tr>
<tr>
<td>Innovation process</td>
<td>Improved product development, process-/ market innovation, integration of new technologies</td>
<td>(5)</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Gain knowledge, bring expertise to the firm</td>
<td>(2), (5)</td>
</tr>
<tr>
<td>Costs management</td>
<td>Cost management, profitability, efficiency</td>
<td>(5)</td>
</tr>
<tr>
<td>Cut costs and time</td>
<td>Cut cost and time from leveraging external development</td>
<td>(1)</td>
</tr>
<tr>
<td>Risk sharing</td>
<td>Distributing the risks among the participant</td>
<td>(2)</td>
</tr>
<tr>
<td>Strengths</td>
<td>Contributing specific strengths</td>
<td>(3)</td>
</tr>
<tr>
<td>Capacity</td>
<td>Cannot do it alone, counterbalance lack of capacity, combine available resources, establishing required resources</td>
<td>(2) (3) (5)</td>
</tr>
<tr>
<td>Business strategy</td>
<td>Deriving alliance objectives from business strategy</td>
<td>(3)</td>
</tr>
<tr>
<td>Definition</td>
<td>Precise definition of rights and duties</td>
<td>(3)</td>
</tr>
<tr>
<td>Implementation</td>
<td>Speedy implementation and fast results</td>
<td>(3)</td>
</tr>
</tbody>
</table>

Table 2-5: Success factors  
Sources: (1) Chesbrough, (2007); (2) Coraş & Tanţău (2013); 3 Hoffmann & Schlosser (2001); (4) Spithoven et al. (2013); (5) Van de Vrande et al. (2009);
2.7 Barriers

Changes in business structures and models often come with several barriers which have to be overcome. First the adoption challenges a company may have to overcome when changing from a closed business model to an open business model, as described by Chesbrough and Crowther (2006), will be discussed. There are also distinct barriers for the collaborative forms of open innovation, for instance when practicing external networking for support in innovation processes. Van de Vrande et al., (2009) have done an extensive study in what barriers SMEs perceive. The main barriers, with respect to collaborative forms of open innovation, will be discussed secondly. And finally, Lee et al., (2010) have performed a study on active ‘strategic alliance’ type of collaboration, and compared their top 10 barriers between SMEs and large firms. The main barriers found in these studies, and the differences, will be discussed lastly. The research found will be compared and discussed and used for the design parameters in the design section of this thesis. The barriers are summarized in table 2-6.

2.7.1. Adoption Challenges

Chesbrough and Crowther (2006) describe two adoption challenges an organization has to overcome to effectively adopt open innovation concepts. The first is a known challenge known the NIH syndrome (Katz & Allen, 1982). The second challenge is based on internal commitment.

NIH syndrome

One of these barriers, a prominent barrier for external knowledge acquisition, is the “not-invented-here” (NIH) syndrome. This syndrome is defined as the tendency of a project group of stable composition to believe it possesses a monopoly of knowledge in its field, thus rejecting new ideas from outsiders to the likely detriment of its performance (Chesbrough & Crowther, 2006; Katz & Allen, 1982). This syndrome therefore leads to a resistance against ideas from outside sources, hampering open innovation by not being resistant for accepting any innovation that falls outside of the internal R&D.

Chesbrough & Crowther (2006) found that organisations found way to overcome the NIH challenge. This is done by clearly articulating the growth gap and explaining why internal efforts are insufficient to meet objectives, building greater organizational alignment and commitment to an open innovation approach. More commitment within R&D can also be gained by involving R&D early in the process, rather than bypassing it, when a firm adopts open innovation concepts as well as when an organization identify external technologies where internal R&D can be leveraged to add further value.
Sustained commitment

Another adoption challenge for open innovation is that it requires sustained internal commitment over sufficient time before the benefits can be realized. For example, it may take time to find trusted external network partners to the support innovation processes that an organisation is working on. Senior management support and funding is required from the beginning, as well as certain ‘open innovation champions’. These ‘Champions’ are individuals who are motivated to engage in open innovation and may convince other to overcome barriers. ‘Open innovation champions’ manage the processes that incorporate the technologies in the business, and revised internal processes, metrics, and incentives to fully adopt open innovation in the business structure (Chesbrough & Crowther, 2006).

2.7.2. Barriers for SMEs

Van de Vrande et al. (2009) and Coraş and Tanţău (2013) have conducted research at SMEs regarding incentives, trends and barriers that SMEs perceive when they adopt open innovation practices and engage in collaborations. The main barriers that were perceived, mainly looking at collaborative forms of open innovation, are discussed here.

Organizational culture / social capital

One of the most important challenges that firms face when two or more companies are working together are organization and corporate-culture related. These challenges arise when they engage in venturing, participation in other firms, and the involvement of external partners and users. Open innovation when cooperating with different organizations frequently lead to problems concerning the division of tasks and responsibility, the balance between innovation and day-to-day management tasks, and communication problems within and between organizations. When venturing, it also includes employees leaving the main organization (van de Vrande et al., 2009).

Administration

Another barrier includes the administration related problems. Administration related problems occur in the context of venturing, participation in other firms and the involvement of external partners. These administrative burdens are prominent when the company receives subsidies and grants from governmental support. This support is often experienced by the SMEs as being highly inflexible. This inflexibility can be a serious barrier because it is often not allowed to change partners or end such a program prematurely (van de Vrande et al., 2009).

Quality of partners

A problem that is exclusive for external networking and outsourcing R&D is when companies involve external partner; they do not meet the expected results. Expectations are not met or the service a
product does not meet the quality that is required (van de Vrande et al., 2009). ‘Opportunism’ includes conflicting interests of partners, or developing dependency on partners, and relational risk. And finally lack of trust and communication among partners or when collaboration suddenly dissolved due to partner leaving can be hampering factor (Coraş & Tanţău, 2013).

Resources
More minor barriers are the costs of innovation, obtaining financial resources, and the availability of time. These barriers are present for almost any type of open innovation, but are, overall, considered only a small barrier to adopt open innovation. The problems with regard to obtaining financial resources is, however, mainly present in venturing, external networking, and outsourcing R&D (van de Vrande et al., 2009).

Collaboration
There are also collaboration risks that are present but are not directly related to the partners. These can occur due to the higher complexity of managing open innovation, making it difficult to balance innovation with daily tasks. They can also include the lack of control of external resources compared to internal ones. Finally, unintentional knowledge sharing or lack of protecting the property rights can result in core knowledge flowing out to competing organizations (Coraş & Tanţău, 2013; van de Vrande et al., 2009).

Workforce deficiencies
Shortages in suitable manpower within the firm, high staff turnover (usually for R&D) combined with difficulties in finding suitable manpower in a labour market can pose barriers to adopt innovation practices (Coraş & Tanţău, 2013; Lee et al., 2010).
2.7.3. Barriers SMEs compared to large firms

Lee et al., (2010) focused their research on ‘strategic alliance’ types of collaboration, with regard to open innovation, and compared the top 10 barriers of SMEs against those of large firms. One of the conclusions made was that SMEs that are taking a more active interest in technology innovation, and were therefore involved in strategic alliance, were also those who were most conscious of the difficulties involved. The top 10 barriers, compared to large firms, are presented in appendix table A-3.

Their research shows that there are significant differences in the perceived barriers between SMEs and large firms. The barriers that SMEs struggle with the most, according to this research, are often shortages in labour, lack of information, lack of infrastructure and lack of financial resources, corresponding with van de Vrande et al., (2009). Large firms indicate difficulties that can be summed up as: oligopolists, needlessness of innovation and R&D department without power.

Barriers are present in any form of open innovation a SME may wish to adopt. The strongest perceived barriers are present when venturing, participating in other firms, and with the involvement of external partners and users. Many of the barriers are inherent to SMEs, a lower pool of available resources, manpower and time can be a barrier for open innovation, while it is also one of the main incentives to overcome shortages through sharing. The collaboration barriers and quality of partners are concerns that are often present in collaboration. There also seem to be differences in the barriers between SMEs and Large firms, suggesting a different approach might be needed to tackle these barriers. The barriers are summarized, with their definition and sources in Table 2-6.
<table>
<thead>
<tr>
<th>Barriers</th>
<th>Definition</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manpower</td>
<td>Short of suitable manpower within the firm</td>
<td>(2) (3)</td>
</tr>
<tr>
<td>Low retention</td>
<td>Frequent turnover human resources (usually for R&amp;D), Difficulties in finding suitable manpower in a labour market</td>
<td>(3)</td>
</tr>
<tr>
<td>Mentality</td>
<td>Employees resistance to innovation and change, poor understanding of their role, safety mentality</td>
<td>(2)</td>
</tr>
<tr>
<td>Knowledge barriers</td>
<td>Insufficient technical expertise or training of employees, insufficient knowledge about partners</td>
<td>(2)</td>
</tr>
<tr>
<td>Market uncertainty</td>
<td>Market uncertainty in innovative products, lack of market information</td>
<td>(2) (3)</td>
</tr>
<tr>
<td>Regulations</td>
<td>Volatile and ambiguous industry regulations</td>
<td>(2)</td>
</tr>
<tr>
<td>Corruption</td>
<td>Unethical behaviour of the partners of related to state administration bodies</td>
<td>(2)</td>
</tr>
<tr>
<td>Administration</td>
<td>Large volume of paperwork, administrative burdens, conflicting rules</td>
<td>(2) (4)</td>
</tr>
<tr>
<td>Clients</td>
<td>Constantly changing needs of the clients, requiring customized products</td>
<td>(2) (3)</td>
</tr>
<tr>
<td>Imitations</td>
<td>Technology leakage to rivals, Imitation possibilities of technology innovation</td>
<td>(2) (3)</td>
</tr>
<tr>
<td>Technology</td>
<td>Risk from technological uncertainty, inability to adapt to technological advances, lack of technological information</td>
<td>(2) (3)</td>
</tr>
<tr>
<td>Low absorptive capacity</td>
<td>Low ability to absorb or rejecting new external ideas and technologies (NIH)</td>
<td>(1) (2)</td>
</tr>
<tr>
<td>Organization and corporate-culture</td>
<td>Balancing innovation and daily tasks, communication problems, aligning partners, organization of innovation</td>
<td>(2) (4)</td>
</tr>
<tr>
<td>Poor social capital</td>
<td>Poor work ethic, uneducated workforce generating lack of trust</td>
<td>(2)</td>
</tr>
<tr>
<td>Management</td>
<td>Low support of top management for innovation, lack of sustained commitment, low awareness of risks, insufficient managerial skills, short of ability in R&amp;D planning and management</td>
<td>(1) (2) (3)</td>
</tr>
<tr>
<td>Quality of partners and performance</td>
<td>Partner does not meet expectations, deadlines are not met resulting in that collaboration objectives may not be met</td>
<td>(2) (4)</td>
</tr>
<tr>
<td>Complexity</td>
<td>Higher complexity of managing open innovation, difficulty in balancing innovation with daily tasks</td>
<td>(2) (4)</td>
</tr>
<tr>
<td>Control</td>
<td>Low control of external resources compared to internal ones</td>
<td>(2)</td>
</tr>
<tr>
<td>Opportunism</td>
<td>Conflicting interests of partners, developing dependency on partners, relational risk</td>
<td>(2)</td>
</tr>
<tr>
<td>Lack of trust</td>
<td>Lack of trust an communication among partners, collaboration suddenly dissolved due to partner leaving</td>
<td>(2)</td>
</tr>
<tr>
<td>Knowledge sharing</td>
<td>Lack of protecting the property rights, core knowledge flowing out to competing organizations</td>
<td>(2)</td>
</tr>
<tr>
<td>Resources</td>
<td>Costs of innovation, time needed</td>
<td>(2) (4)</td>
</tr>
<tr>
<td>Technological uncertainty</td>
<td>Funding difficulties due to high risk from technological uncertainty</td>
<td>(3)</td>
</tr>
<tr>
<td>Commercialisation</td>
<td>Funding difficulties due to high innovation and commercialisation costs</td>
<td>(3)</td>
</tr>
</tbody>
</table>

Table 2-5 Sources: (1) Chesbrough and Crowther (2006); (2) Coraş & Tanţău (2013); (3) Lee et al. (2010); (4) van de Vrande (2009);
2.8 Open innovation intermediaries

As discussed, there are several barriers and problems with collaborative forms of open innovation, and even open innovation on its own. However, there are certain innovation intermediaries that can lower these barriers by facilitating the entry and interaction of firms into unknown industries or sectors, and also by helping those lacking appropriate architecture to create and capture value from external networking opportunities (Chesbrough H., 2006). First, an overall conceptual framework, proposed by (Lee et al., 2010), will be presented to describe the overall activities that an intermediary involves with. Then, the 4 different forms of innovation intermediaries as proposed by Lopez-Vega and Vanhaverbeke (2010) will be presented and described.

2.8.1. Conceptual framework Intermediary

The role of the active innovation mediator is proposed of three direct activities (Lee et al., 2010), Network Database, Network Construction, and Network Management.

The Network Database activity’s purpose is to identify appropriate collaborative partners. An innovation mediator can, by collecting information on technologies, markets and competitors, and potential partners create and maintain a relevant database. The purpose of this database is to find information to support SMEs search processes.

In the second role, Network Construction, the mediator can, by supporting technology transfer to improve strategic technology management, by evaluating each firm to assist in the construction of a network of matching SMEs, by proposing an effective network structure, and by encouraging geographical clustering, help network construction. The intermediary can hold important information to evaluate each SME objectively and provide other SMEs with the results of their analysis. By only providing the results of the analysis, instead of the original information, this can reduce the reservations that an organisation might have for sharing their core competences or detailed R&D information.

The third direct role, Network Management, includes the support for process the collaborations. An advisory board can help with problem solving. The mediator can also provide consulting to provide information about taxes, law, regulations, and finance.

The indirect support, develop the culture of collaboration and facilitate collaboration, can help the networking efforts of the SMEs. Improving the culture of collaboration can be done through analysing collaboration needs, success and failures, by developing policies.
2.8.2. Innovation intermediary typology

There are several forms of intermediaries that act with different goals and through different business models. Therefore, Lopez-Vega and Vanhaverbeke (2010) have created a typology of intermediaries combined with their business model configuration in Table 2-6. Each category will be briefly explained.

**Innovation consultant**

The way an innovation consultant creates value is by developing efficient value drivers to come up with new innovation methods and tools. These methods and tools are used for tackling certain issues which can range from R&D to commercialisation. First, through scanning and information processing they attempt to solve certain innovation problems while searching for possible local and international trends, increase the predictability of the results and the flexibility of the resources, detect and explore the technological and innovation opportunities and finally, provide services for analysing, protecting and leveraging patents. Secondly, they offer advice during licence acquisition by firms or during commercialization of R&D results from universities and research labs. And lastly this form of intermediaries also provides mechanisms for analysing, assessing, protecting and leveraging patents (Lopez-Vega & Vanhaverbeke, 2010).

**Innovation trader**

Innovation traders aim to find specific solutions to certain managerial or scientific problems in firms by setting up the condition for others, innovation seekers and solvers, to solve. The firms that may have these problems either lack the time or in-house resources to develop the technology that they need. Therefore they rely on the innovation trader that uses their established network of innovation solvers and strong ties with companies to search for the technology that is needed. These innovation traders are interested in short-term collaborations, in many cases the collaboration is based on a single problem, or a certain amount of problems (Lopez-Vega & Vanhaverbeke, 2010).

**Innovation incubator**

Innovation incubators seek interaction with other companies in order to come up with new innovations and to procure innovation services (Lopez-Vega & Vanhaverbeke, 2010). Innovation incubators can be divided into non-profit and for-profit incubators. For-profit incubators aim to create value through service fees in short term and equity stakes in new ventures for medium to long-term value creation, and include both independent incubators and corporate incubators. The difference in creating value for independent and corporate incubators is that independent incubators aim at the creation of fast profits from successful start-ups, while corporate incubators look to extract value from
their own portfolio of technologies, or explore new technology for their core businesses (Becker & Gassmann, 2006; Lopez-Vega & Vanhaverbeke, 2010).

Non-profit are mainly government-funded, community, university or technology science park based incubators, and focus on social gains. Since a science park can belong to a university and have a close cooperation with it, the line between the two is very thin. There are non-government non-profit incubators as well, funded by private or business initiatives.

**Innovation mediator**

Innovation mediators establish and try to maintain relationships, with external entrepreneurs, users or scientists, in an open platform. Private or a public-private partnership (PPP) these intermediaries facilitate the emergence of firm business or a specific system of innovation. These intermediaries use the relationships they have obtained to work on problems that need an open innovation environment as opposed to a Closed Innovation environment. Their value is created by creating environments, for firms and universities to collaborate in innovation opportunities, through their intensive network of external stakeholders which they use to identify opportunities and commercialize technologies (Lopez-Vega & Vanhaverbeke, 2010).

In short, Lopez-Vega & Vanhaverbeke (2010) describe the four kinds of intermediaries based on from a managerial perspective on the following conditions:

- **Innovation consultants**: managers seeking specific solutions or information, interested on services and with a technology request close to the market.
- **Innovation traders**: managers searching for specific solutions to managerial or scientific problems in firms lacking either time or in-house resources to develop the technology and that are interested on short-term collaboration.
- **Innovation Incubator**: managers seeking interaction with other companies in order to come up with new innovations and to procure innovation services.
- **Innovation Mediator**: managers seeking to establish relationships in an open platform, develop early stage technologies and innovations.
These four typologies of mediators facilitate the entry and interaction of firms into unknown industries or sectors, and help those firms lacking of an appropriate architecture to create and capture value from external networking opportunities (Chesbrough et al, 2006). Even though it may vary what intermediary may be useful for an organization’s needs at that time, they provide certain know-how and/or network that may help an organization to adopt open innovation in their business model.

3. Research Method
In this section, the research method will be described. The research aims to find to what extent representatives from organizations can be influenced by mediators to become willing to actively participate in collaborative forms of innovation. The study will be descriptive of nature, trying to assess the current issues, to provide an answer to the problem statement. The first goal is the describe a valid representation of incentives, barriers and success factors with regard to collaborative forms of open innovation, the second goal is to provide an answer to the research questions based on the problems and advice presented by the focus group and the literature, the third is incorporate these answers into a design for innovation mediators. This section will provide insight on how the research is conducted. First, a description will be given on the overall research, followed by an introduction of the company where the research is conducted; finally the focus group will be introduced.

3.1.1. ISPT
ISPT is a Dutch non-profit PPS organisation that connects stakeholders from different sectors and disciplines from the world of Process technology. On initiative of ISPT the different organisations partner up to work in projects on innovation. The innovations must lead to more sustainable process technology as well as economic impact for companies that use process technology to produce consumer goods. These companies are called end-users and they search for impact by better product quality, lower costs, or producing new product and entering new markets. They distinguish themselves as an innovative intermediary between industries, SME’s, knowledge institutes and government, with a special interest in Sustainable Process Technology.

The innovations also lead to new possibilities for the companies that develop, design and deliver the process technology to these end-user companies. These companies are called technology suppliers. Their improved technology must make it able for Netherlands to distinguish itself in the International innovation landscape.

ISPT’s mission is to realize and maintain an active and open innovation platform (R&D platform) for sustainable process technology where all stakeholders can optimally work together within an
inspirational and trusted environment thereby maximizing the contribution to (break through) innovations.

ISPT aims to build and maintain a trusted based network in which all relevant partners collaborate on break through innovations. This is achieved by the innovative way of working and by the open and active character of the knowledge infrastructure. ISPT delivers knowledge on process technology solutions, connects organisations and partnerships and inspires people to choose for a career in the world of process technology.

ISPT focuses on the following areas:
- Research, because collaborative innovations advance the process industry
- Europe, because the scope of our work transcends the Dutch borders
- Education, because people drive innovation

ISPT works in a series of clusters, e.g. Energy Efficient Bulk Liquid Separation or Drying and Dewatering. These clusters are meant to ensure that enterprises that work in same general technology sector regularly meet.

**Education**

The education ISPT offers in apparent their Innovation Academy. They offer a process technology grant programme for HBO students providing in-depth knowledge about process technology and the latest innovations. This three-year programme on top of the HBO studies is in collaboration with several universities they engage with.

They also offer the ‘OnderzoekSchool ProcesTechnologie’ (OSPT), which is the Netherlands Research School in Process Technology. It is an interuniversity school in the area of Chemical Engineering and Process Technology. OSPT is part of the Innovation Academy of ISPT where they offer (post graduate) education- and research activities of the collaborating research group of the five universities they are engaged with.

**SME**

ISPT offers support specifically aimed at SMEs. Their SME contact group regularly organizes thematic meetings for participants and non-participants. A major topic of the meetings is to come up with new radical solutions for industrial challenges together.

Technology validation projects offer SME the chance to demonstrate their innovative technology for industrial streams of end-user industries. According to ISPT, the multiple success stories prove that this leads to fast implementation of new technologies.
ISPT frequently reviews her roadmap with all relevant stakeholders. SME plays an important role in this process. SME defines her technological and programmatic objectives and performance indicators. In this way SME gives direction to the ISPT discovery and development program.

ISPT also supports start-ups from implementations to the next phase. We provide coaching on organizational issues and advice on patent policy. We offer SME shared facilities and infrastructures to reduce costs. They help SMEs to participate in exhibitions and congresses and actively communicate technological successes within the international processing community.

ISPT supports the SME to obtain finance and/or funding for their innovation initiatives via:
- match making with other running innovation projects
- developing new innovation consortia including the financial arrangements
- providing information about project related public funding sources

ISPT can, under the innovation intermediaries, be classified as an innovation mediator. They try to maintain relationships, with external entrepreneurs, users or scientists, in an open platform while using these relationships to work on problems that need an open innovation environment as opposed to a Closed Innovation environment. On top of this, they use their experience and network to acquire funding for projects. ISPT also performs some Innovation Consultancy roles in the form of offering advice. This is however, mainly a secondary role (Becker & Gassmann, 2006).

3.2 Focus group description

This research covers an extensive focus group meeting of 10 SME representatives and the SME Account Manager as well several interviews with the Operational Program Manager of the Innovation Mediator ISPT. The reason that a focus group was chosen as the base for thesis is that a focus group encourages discussion among the participants. This may provide, not only a design canvas to summarize the strong and weak points of the mediator, it may also help finding solutions to the problems they have encountered. The focus group will be used to provide insight into some of the incentives, success factors and barriers the group perceives, but also to reveal any other design parameters by elaborating on the key activities and resources of a mediator.

The focus will be on the individuals that represent the organisation towards a mediator. The focus group meeting is based on the literature review. The focus group consisted of SMEs that are actively engaged with an innovation mediator, namely ISPT, and the coordinator of SME’s at ISPT. The SME’s ranged from enterprises that have only recently joined with ISPT to SMEs with longer lasting
relationships with ISPT. The SMEs have been asked about their personal experiences with ISPT and open innovation projects.

A focus group consists of a small number of people who are broad together by a moderator to focus on a specific topic, here the innovation mediator. A focus group meeting aims at discussion instead of individual responds to formal questions. The focus group was asked to create a Business Canvas for the ideal Innovation Mediator, guided by the SME Account Manager in an informal manner. The Business Canvas was, in this setting, used as a tool for the focus group to find what they were content with and where improvements could be made. In the end, this method results in a structured overview of where they perceive barriers for collaborative forms of innovation, and what role an Innovation Mediator such as ISPT should have to alleviate these barriers.

It was semi-structured by the general topics based on the concepts of the Business Canvas. The topics were extensively discussed both for general Innovation Mediators as for ISPT specifically. After each topic was discussed there was room for general discussions on the topics.

The focus group meeting will be the main focus of the research. This will be important to discuss any the issues that the SME’s may find, and any solutions. The objective of the focus group is for the group to devise a strategic canvas for ISPT. Through this tool, the expectations of the SME’s, barriers to collaborate and previous experiences will be discussed.

3.2.1. Company selection

The companies selected for the focus group were a mix of 10 SME’s that were involved with Innovation Mediators over extended periods of time and SME’s that had little experience with Innovation Mediators. The group consisted of high tech SMEs that where involved in a form of separation technology, engineering, biopharmaceuticals and electronics manufacturing, and /or waste technology as can been seen in table 3-1.

<table>
<thead>
<tr>
<th>General key activities</th>
<th>Amount of SMEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>3</td>
</tr>
<tr>
<td>biopharmaceuticals and electronics manufacturing</td>
<td>1</td>
</tr>
<tr>
<td>Separation technology</td>
<td>4</td>
</tr>
<tr>
<td>Waste</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3-1: focus group composition

The majority was currently actively involved with an Innovation Mediator and either had completed, or was currently running in, one or more projects. The companies were invited by use of email. The meeting was concluded when the canvas was completed sufficiently.
4. Analysis

In this section, first, the focus group meeting will be discussed and any parameters the barriers, success factors and key activities for innovation intermediaries from the interview and the business canvas will be added. These design parameters will be used to create a design for innovation mediators. After the design parameters have been coded from the focus group meeting, the barriers, incentives and success factors from the literature will be added.

The analysis will then continue by giving a range to the parameters, e.g. low to high, and the desired value will be given that an innovation mediator should strive for. At the end of each section, the parameter will be given an impact value. This value will be an estimate how much the value of the parameter will influence the success of the collaborative forms of open innovation the mediator is in cooperation with. The impact rating is based on the literature and the focus group.

4.1 Focus group

First, the focus group meeting will be reviewed. In the focus group meeting, consisting of the representatives of several SME’s that are partners with ISPT, the participants were asked to design a business canvas for ISPT. As indicated before, the group consisted of several active SME’s and the coordinator of SME’s at ISPT, Jan Koning. The SME’s ranged from enterprises that have only recently joined with ISPT to SME’s with longer lasting relationships with ISPT. This varied group told of their own experiences with cooperating in open innovation and with ISPT. The goal was to create the perfect innovation mediator based on the wishes and experiences of the clients. The main findings and conclusion from the discussions related to the research are summarized here, are related to the key activities and value propositions described in the business canvas. The business canvas, combined with the discussions and conversations during the meeting, have been coded to add to the design parameters and to create new parameters. The parameters gained from the focus group and the design canvas is presented in table 4-1.

Match making and selection

One of the key activities, in the business canvas, that were discussed was considered as the match making role of an innovation mediator. The focus group thought that it should be possible for an organisation to (1) show what you are working on, and (2) tell about your core competences. Trust is an important factor here. Even though the SME’s are somewhat comfortable discussing these two points among other, trusted SME’s, they found it hard to discuss these points with larger companies therefore increasing the difficulty for cooperation. Larger companies are, in the experience of our focus group,
reluctant to discuss any current projects they are working on. Since the match making role is seen as a key activity for an innovation mediator, a method should be constructed for companies to safely show what they need or are working on. This should be done without the fear of compromising their strategic position by giving away information to a competitor.

Reference point and selection tool
Since trust is a key factor for collaboration, the institutes working with ISPT should be selected on a personal trust basis. This can be done based on experiences of other partners with these institutes, ISPTs own experience or general reputation. The engagement with ISPT can provide a reference point in whether an organisation is trustworthy, by being selective in what institutes ISPT affiliates with.

SME also would like an Innovation Mediator to be a selection tool. ISPT as an impartial mediator knows what partners may need and can offer, and can therefore close the gap between what is needed and what can be provided. It was noted that the focus group lacked a searching tool or system in which competences could easily be found, as well as activities to establish focused interaction.

SME also would like an Innovation Mediator to be a selection tool. ISPT has a certain pool of partners, and has experience with these partners. This can help for a SME to find a partner whom they can trust, based on the experiences from ISPT. Furthermore, ISPT as an impartial mediator could know what partners may need and can offer and can therefore close the gap between what is needed and what can be provided. It was noted that the focus group lacked a searching tool or system in which competences could easily be found, as well as activities to establish focused interaction.

Innovation coaches and assistance with setting up cooperation
ISPT has extensive experience with working with SME’s. This helps for ISPT to think from a SME’s perspective. Examples that were given is that SME’s have lesser resources and in the form of time and funds. An Innovation Mediator should therefore actively try to reduce the time invested by an SME in order to find a suitable project. Another example is the informal manner these SME’s prefer compared to very formal meetings and prefer when agreements not rigid and not too imperative.

ISPT has, due to their experiences, specific know how in collaboration, starting a SME and how to obtain subsidy. ISPT supports start-ups by both providing coaching on organizational issues, and advice on patent policy. An example mentioned was how ISPT had helped a SME start a project. This SME did not have any prior experience with ISPT or collaborating. ISPT, with their experience, guided them successfully though this project which otherwise probably not have been possible. This example shows that the specific know how in collaboration and B2B open innovation creates value for an Innovation Mediator.
**Subsidy**

Due to their experience, wide network, and sustainability focus, ISPT has short lines on getting subsidy. They know what subsidies may be available and how to start on getting these subsidies, thus creating funds to help start these projects. ISPT supports the SME to obtain finance and / or funding for their innovation initiatives via:

- match making with other running innovation projects
- developing new innovation consortia including the financial arrangements
- providing information about project related public funding sources

**Customer relationship**

The customer relationship is an important factor for SME’s for their willingness to working with ISPT. In the focus group there was an agreement that this relationship should be more than just a client – supplier relationship. For these SME’s, mutual trust and a positive mutual cooperation was deemed more important in an agreement than hard and thick contracts, both for the relationship with ISPT as with other enterprises. It was suggested that this was one of the problems for and SME when dealing with larger enterprises. An important consideration opted by the focus group, was that it is hard for them to contact representatives outside of their cluster. As explained in the description of ISPT, the customer are divided in several clusters. An SME can only join one cluster and interaction between clusters is insufficient. Though these clusters are created to maintain the variety of enterprises, it shows that there is a challenge in the match making opted in key activities. ISPT actively tries to focus companies by the use of these sectors. However, the challenge is to focus without constricting conversation.
Overall it can be noted that the SMEs require an Innovation Mediators to very be active in their role. This focus shows that there is a need among SMEs for an Innovation Mediator that is more active in guiding their Innovation efforts. The most important findings are that the SMEs seem to want Mediators to actively reduce the barriers for SMEs the engage in collaborative forms of innovation. Where ISPT does this, they are very positive. Secondly, a trusted network is very important. Trust is basis for collaborating and seems to be established mostly by informal communication between parties. Trust is still a barrier when collaborating with larger enterprises due to the lack of communication. Lastly, they want the mediator not be just a mediator, but also an advisor, match maker and innovation coach. Guiding the SMEs through the project and helping them with their experiences in collaborative forms of open innovation seems to be a very important factor.
4.1.1. Barriers

In this section, the barriers that have been discussed that may present themselves when adopting open innovation practices and/or collaborating with other organisations have been grouped together in design parameters. The parameters have been derived mainly from Coraş and Tanţău (2013) and van de Vrande (2009). The parameters, presented in Table 4-2, will shortly be defined and reviewed. Table 4-3 shows the parameters with their impact value, parameter range and their desired value. These values will also be discussed.

<table>
<thead>
<tr>
<th>Sources</th>
<th>Barriers</th>
<th>Parameters</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) (3)</td>
<td>Manpower</td>
<td>Workforce deficiencies</td>
<td>lack manpower, high staff turnover and the lack of expertise, training or knowledge with regard to the employees</td>
</tr>
<tr>
<td>(3)</td>
<td>Low retention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Knowledge workforce</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) (3)</td>
<td>Market uncertainty</td>
<td>Regulations and market barriers</td>
<td>Market posed barriers and uncertainties, regulation, administration and corruption barriers</td>
</tr>
<tr>
<td>(2)</td>
<td>Regulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Corruption</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) (4)</td>
<td>Administration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) (3)</td>
<td>Clients</td>
<td>Client issues</td>
<td>Constantly changing needs of the clients, requiring customized products</td>
</tr>
<tr>
<td>(2) (3)</td>
<td>Imitations</td>
<td>Technological risks</td>
<td>Ability to adapt to technological advances, lack of technological information, technology leakage to rivals, imitation possibilities of technology innovation</td>
</tr>
<tr>
<td>(2) (3)</td>
<td>Technology uncertainty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) (2)</td>
<td>Low absorptive capacity</td>
<td>Organizational culture/social capital barriers</td>
<td>The culture in an organisation prohibits or diminishes the gains of open innovation, organizational issues.</td>
</tr>
<tr>
<td>(2) (4)</td>
<td>Organization and corporate-culture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Mentality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Poor social capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) (2) (3)</td>
<td>Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) (4)</td>
<td>Quality of partners and performance</td>
<td>Collaboration risks</td>
<td>Quality of partners and performance, opportunism and lack of trust</td>
</tr>
<tr>
<td>(2) (4)</td>
<td>Complexity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Opportunism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Lack of trust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Knowledge sharing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) (4)</td>
<td>Resources</td>
<td>Lack of resources</td>
<td>Lack of resources, and funding difficulties</td>
</tr>
<tr>
<td>(3)</td>
<td>Technological uncertainty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td>Commercialisation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-2: Parameters barriers, sources and definition
Sources: (1) Chesbrough & Crowther (2006); (2) Coraş & Tanţău (2013); (3) Lee et al. (2010); (4) Van de Vrande (2009);
Workforce deficiencies

The parameter ‘workforce deficiencies’ includes all forms of lack manpower, high staff turnover and the lack of expertise, training or knowledge with regard to the employees. Short of suitable manpower within the firm, high staff turnover (usually for R&D), combined with difficulties in finding suitable manpower in a labour market can pose negative spiral which may be hazardous for the innovation process of SMEs and it is marked as a strong barrier or difficulties in collaborative forms of open innovation (Chesbrough & Crowther, 2006; Coraş & Tanţău, 2013; Lee et al., 2010)

Regulations and market barriers

Regulation and market barriers include any market posed barriers and uncertainties, as well as regulation, administration and corruption barriers. Market uncertainty in innovative products or lack of market information can create uncertainties in whether the outcome of the collaboration will end up being profitable. A successful collaboration may still result in a product or service that is not viable for the organisations current market, at that time. Industry regulations that can be ambiguous or volatile may also in costs that were not predicted beforehand. Administrational problems may occur when large volumes of paperwork prove to be a disruptive administrative burden. Finally corruption, unethical behaviour of the partners of related to state administration bodies, may be a barrier for working with or for organisations in specific countries or areas. Mainly the market uncertainties and the administration related barriers are considered significant barriers here (Coraş & Tanţău, 2013; Lee et al., 2010; van de Vrande, 2009).

Client issues

Client issues include all problems that organizations may have with their clients. Examples are constantly changing needs of the clients or clients requiring customized products. When looking at collaborative forms of open innovation, this is only a minor barrier. (Coraş & Tanţău, 2013; Lee et al., 2010)

Technological risks

Technological risks include both technological uncertainty and the risk of imitations. Technological uncertainty includes the inability for an organisation to adapt to technological advances and the lack of technological information. Imitations can be a barrier when technology leaks to rivals or when imitation of the technology is possible in another way. According to the literature, this is considered a medium barrier (Coraş & Tanţău, 2013; Lee et al., 2010).
Organizational culture / social capital barriers

Organisational culture and social capital barriers can occur when the culture in an organisation prohibits or diminishes the gains of open innovation. This includes the employee’s mentality or work ethic, when employees are resistance to innovation and change, have a poor understanding of their role, or a safety mentality, have a poor work ethic, or when an uneducated workforce is generating a lack of trust. This is also includes managerial problems when top management does not fully support the innovation, show a lack of sustained commitment, have low awareness of risks, have insufficient managerial skills, or a short of ability in R&D planning and management (Van de Vrande, 2009).

Finally, there can be a low ability to absorb or rejecting new external ideas and technologies. Literature suggested the not-invented-here (NIH) syndrome as a cause behind this barrier. Noting that the NIH syndrome may appear when a project group of stable composition to believe it possesses a monopoly of knowledge in its field, thus rejecting new ideas from outsiders to the likely detriment of its performance (Chesbrough & Crowther, 2006; Katz & Allen, 1982). The problem of high staff turnover discussed at the ‘workforce deficiencies’ parameter, however, conflicts with the reasoning behind the NIH syndrome. With high staff turnover, it is debatable whether NIH syndrome is a real barrier for SMEs or if the low ability to absorb or rejecting new external ideas and technologies has other causes. Overall, the organisational culture / social capital barriers parameter is considered to have a high impact (Chesbrough & Crowther, 2006; Coraş & Tanţău, 2013; Lee et al., 2010; van de Vrande, 2009).

Collaboration risks

Any risks involving collaboration are grouped in the collaboration risks parameter. The risks and barriers that directly relate to the partner are ‘quality of partners and performance’, ‘opportunism’ and ‘lack of trust’. ‘Quality of partner risks and performance’ are noticed when the partner does not meet expectations or when deadlines are not met resulting in that the collaboration objectives may not be met. These risks may be reduced by a thorough selection of partners based on past experiences or general reputation. ‘Opportunism’ includes conflicting interests of partners, or developing dependency on partners, and relational risk. And finally lack of trust and communication among partners or when collaboration suddenly dissolved due to partner leaving can be hampering factor. (van de Vrande, 2009).

There are also collaboration risks that are present but are not directly related to the partners. These can occur due to the higher complexity of managing open innovation, making it difficult to balance innovation with daily tasks. They can also include the lack of control of external resources compared to internal ones. Finally, unintentional knowledge sharing or lack of protecting the property rights can
result in core knowledge flowing out to competing organizations. The ‘collaboration risks’ parameter is considered to have a high impact (Coraş & Tanţău, 2013; van de Vrande, 2009).

**Lack of resources**

The ‘lack of resources’ parameter is a common problem for SMEs, and includes both funding difficulties as well as the lack of time available. The costs of innovation or time needed can be a barrier for starting open innovation. And the technological uncertainty and commercialisation costs can make funding difficult. SMEs found this to be a medium barrier (Coraş & Tanţău, 2013; Lee et al., 2010; van de Vrande, 2009).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Impact</th>
<th>Parameter range</th>
<th>Desired value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workforce deficiencies</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Regulations and market barriers</td>
<td>Medium</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Client issues</td>
<td>Low</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Technological risks</td>
<td>Medium</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Organizational culture / social capital barriers</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Collaboration risks</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Lack of resources</td>
<td>Medium</td>
<td>low-high</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 4-3: Parameters and impact of the barriers
4.1.2. Success factors

The success factors will be discussed in the same manner as the barriers have been. The factors that help to increase the chances of a successful outcome when adopting open innovation practices and/or collaborating with other organisations have been grouped together in design parameters. These parameters have been derived mainly from Coraş & Tanţău (2013) and van de Vrande et al. (2009). The parameters, presented in Table 4-4, will shortly be defined and reviewed. Table 4-5 shows the parameters with their impact value, parameter range and their desired value. These values will also be discussed.

<table>
<thead>
<tr>
<th>Sources</th>
<th>Success factors</th>
<th>Parameters</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4), (5)</td>
<td>Market</td>
<td>Market-related motives</td>
<td>The need to keep up with current market developments, customers and to increase growth and/or market share</td>
</tr>
<tr>
<td>(4)</td>
<td>New offerings</td>
<td>Process</td>
<td>Improved product development, process-/market innovation, and the integration of new technologies</td>
</tr>
<tr>
<td>(5)</td>
<td>Innovation process</td>
<td>Knowledge gain</td>
<td>Gaining knowledge and bringing expertise to the firm</td>
</tr>
<tr>
<td>(2), (5)</td>
<td>Knowledge</td>
<td>Costs (Cost reduction)</td>
<td>Cost management and the potential increase in capacity, the increase of profitability and efficiency</td>
</tr>
<tr>
<td>(5)</td>
<td>Costs management</td>
<td>Sharing and capacity</td>
<td>The sharing of risks, strengths and capacity</td>
</tr>
<tr>
<td>(1)</td>
<td>Cut costs and time</td>
<td>Business strategy</td>
<td>Aligning the business strategy, defining the rights and duties and a speedy implementation and fast results</td>
</tr>
<tr>
<td>(2)</td>
<td>Risk sharing</td>
<td>Definition</td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td>Strengths</td>
<td>Implementation</td>
<td></td>
</tr>
<tr>
<td>(2) (3) (5)</td>
<td>Capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td>Business strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td>Definition</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-4: Success factor parameters

Sources: (1) Chesbrough, (2007); (2) Coraş & Tanţău (2013); (3) Hoffmann & Schlosser (2001); (4) Spithoven et al. (2013); (5) van de Vrande et al. (2009);

Market-related motives

The market-related motives have been found to be the most important incentive to engage in open innovation practices throughout all dimensions of open innovation. The need to keep up with current market developments, customers and to increase growth and/or market share is the main motivation (van de Vrande et al., 2009). In addition to that, SMEs that engage in open innovation see a positive effect on the introduction of new offerings positive effect on the sales of new products/services and have an increased likelihood launching of new products and services (Spithoven et al., 2013). The impact of this parameter is therefore considered high.
**Process**

The enhancement of the total innovation process is parameter of medium impact. It involves improved product development, process-/ market innovation, and the integration of new technologies. The positive effects open innovation can have on the innovation process overall is an incentive for SMEs to adopt open innovation (van de Vrande et al., 2009).

**Knowledge**

Gaining knowledge and bringing expertise to the firm is also an incentive for SME to adopt open innovation practices. It can help to reduce the workforce deficiencies, since the lack of knowledge with regard to the employees is an important barrier there. This parameter is of medium impact (Coraş & Tanţău, 2013; van de Vrande et al., 2009).

**Cost reduction**

The parameter ‘costs reduction’ consists of the ‘costs management’ and ‘cut costs and time’ incentives. The potential increase in capacity are motives with only a minor impact for adopting open innovation practices. Cost management, the increase of profitability and efficiency also seems to be only a minor incentive (Coraş & Tanţău, 2013; van de Vrande et al., 2009).

**Sharing and capacity**

The parameter ‘sharing and capacity’ includes the sharing of risks, strengths and capacity. Sharing can decrease barriers and create incentives. Sharing strengths and capacity can help SMEs overcome their lack of resources. According to the research of Hoffmann & Schlosser (2001), company seeking a successful alliance must contribute individual strengths and look for complementary, or similar, resources (Hoffmann & Schlosser, 2010). Therefore, this parameter is considered to have a high impact on the results of the collaboration.

**Alliance objectives**

Aligning the business strategy, defining the rights and duties and a speedy implementation and fast results are all included in the alliance objectives parameter. These are all critical success factors that help to start a successful alliance and should therefore have a high impact on the results of the collaboration (Hoffmann & Schlosser, 2010).
4.2 Conclusion

The conclusion of the analysis can be summarized by the design parameters as presented in table 4-5. The parameters are divided between barriers, influences that can negatively affect the open innovation outcome, and success factors, that can positively affect the open innovation outcome. The impact score is given, to give an idea on how strongly it affects the outcome, be it in a positive or negative manner. These parameters will be used to create the design based on several design aspects. These design aspects will prioritise the parameters with a strong impact, given that these will have more impact on the outcome of the collaboration.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Impact</th>
<th>Parameter range</th>
<th>Desired value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market-related motives</td>
<td>High</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Process</td>
<td>Medium</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Knowledge gain</td>
<td>Medium</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Costs (Cost reduction)</td>
<td>Low</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Sharing and capacity</td>
<td>High</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Alliance objectives</td>
<td>High</td>
<td>Unaligned-aligned</td>
<td>Aligned</td>
</tr>
</tbody>
</table>

Table 4-4: Success factor parameters with impact and range

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Impact</th>
<th>Parameter range</th>
<th>Desired value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market-related motives</td>
<td>High</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Process</td>
<td>Medium</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Knowledge gain</td>
<td>Medium</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Costs (Cost reduction)</td>
<td>Low</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Sharing and capacity</td>
<td>High</td>
<td>Low-high</td>
<td>High</td>
</tr>
<tr>
<td>Alliance objectives</td>
<td>High</td>
<td>Unaligned-aligned</td>
<td>Aligned</td>
</tr>
<tr>
<td>Workforce deficiencies</td>
<td>High</td>
<td>Low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Regulations and market barriers</td>
<td>Medium</td>
<td>Low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Client issues</td>
<td>Low</td>
<td>Low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Technological risks</td>
<td>Medium</td>
<td>Low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Organizational culture / social capital barriers</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Collaboration risks</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Lack of resources</td>
<td>Medium</td>
<td>low-high</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 4-5: Overview of the design parameters
5. Design

The design proposed is based on the main research question:

*How can representatives from SMEs be influenced by mediators to become willing to actively participate in collaborative forms of innovation.*

The design is an integrated design that includes 3 design aspects. The purpose is to create a viable business model for an innovation mediator that mitigates the risks and barriers that SMEs might experience and enhances the success factors and incentives.

First the final integrated design will be proposed. This design is an integrated design of all 3 design aspects. The design will be presented as in the form of the conceptual framework by (Lee et al., 2010).

In elaboration of the integrated final design, the 3 design aspects will be proposed. The design aspects are based the design parameters that, in turn, are based on the barriers, challenges success factors and incentives found in the literature and focus group meeting. The impact, positive or negative, that the design parameters are expected to have is included in the design. The design aspects are as follows; the first will look at the innovation mediator as a selection tool and match maker which is proposed to be a key activity for an innovation mediator by both the literature (Lee et al., 2010) and the focus group. The second design aspects is the innovation and collaboration coach role a mediator might have, as is mainly proposed by the focus group. The last design aspect is based on leaning and knowledge, for the literature suggested that this is one of the main mitigating factors for many of the barriers. (Coraş & Tanţău., 2013)

The integrated design will critically discussed using a SWOT analysis in which the strengths, opportunities, weaknesses and threats of the design will be reviewed.
5.1 Conceptual framework

The integrated design is the combination of the 3 proposed design aspects. The combination of these interrelated design aspects can be found in Appendix B-1. The final proposed design is illustrated in the conceptual framework in figure 5-1. The role of the active innovation mediator is proposed of three direct activities (Lee et al., 2010).

Figure 5-4-1: Conceptual framework innovation mediator
The first, the network database, remains unchanged compared to the framework proposed by Lee et al. (2010). The network database activity’s purpose is to identify appropriate collaborative partners. An innovation mediator can by collecting information on technologies, markets and competitors, and potential partners create and maintain a relevant database. The purpose of this database is to find information to support SMEs search processes. The first design aspect is therefore partly based on the selection tool and match making role of the mediator, using the network, collaboration risks and regulations, trust, and market barriers.

In the second role, Network Construction, the mediator can, by supporting technology transfer to improve strategic technology management, by evaluating each firm to assist in the construction of a network of matching SMEs, by proposing an effective network structure, and by encouraging geographical clustering, help network construction. The intermediary can hold important information to evaluate each SME objectively and provide other SMEs with the results of their analysis. By only providing the results of the analysis, instead of the original information, this can reduce the reservations that an organisation might have for sharing their core competences or detailed R&D information. To add, to these activities, the active innovation mediator can also guide and help to start the alliances created. Through their knowledge of each organisation’s strengths and weaknesses, and overall collaboration experience, the mediator can help to align the alliance, enhance sharing and capacity to overcome any lack of resources, and help to acquire funding through their network. A mediator should also propose effective network structure by encouraging geographical and market clustering. This is where the second part of design aspect one comes in. Reducing the parameters: collaborating risk an regulations and market barriers, while enhancing match making and selection, trusts and aligning the alliance objectives.

The third direct role includes the support for process the collaborations. An advisory board can help with problem solving with regard to the collaboration. The mediator can also provide consulting services and reduce the risks and barriers involved by helping to balance between innovation and day-to-day management, provide information about taxes, law, regulations, and finance or for overall collaboration. The mediator can also reduce some barriers and risks by becoming a middleman for patents, reducing risks for partnerships especially when SMEs collaborate with large firms.

The indirect support, develop the culture of collaboration and facilitate collaboration, can help the networking efforts of the SMEs. Improving the culture of collaboration can be done through analysing collaboration needs, success and failures, by developing policies and enhancing trust among the clients.
Finally, the mediator can provide training and education with regard to patents management, collaboration and open innovation or for certain technical expertise to enhance the workforce. In combination with educating new entrants to the labour market, this can help to reduce the workforce deficiencies that SMEs may experience.

5.1.1. Aspect 1: The mediator as a selection tool and match maker

One of the key activities proposed by the focus group for an innovation mediator is the match making role. This coincides with the collaboration risks that are partner related and, indirectly, with the ‘alliance objectives’ and ‘sharing and capacity’ parameters. The first design aspect is therefore focused on the ‘selection tool’ and ‘match making’ activities that an innovation mediator should be involved in. The parameters that are used for this design aspect are shown in Table 5-1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Impact</th>
<th>Parameter range</th>
<th>Desired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaboration risks</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Alliance objectives</td>
<td>High</td>
<td>unaligned-aligned</td>
<td>Aligned</td>
</tr>
<tr>
<td>Regulations and market barriers</td>
<td>Medium</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Network</td>
<td></td>
<td>small-large</td>
<td>Large</td>
</tr>
<tr>
<td>Trust</td>
<td></td>
<td>low-high</td>
<td>High</td>
</tr>
<tr>
<td>Match making and selection</td>
<td></td>
<td>easy-hard</td>
<td>Easy</td>
</tr>
</tbody>
</table>

Table 5-1: Parameters design aspect 1

Culture of collaboration

Lack of trust is a major barrier for organisations that are not familiar with each other. A mediator can create an environment where a company should be able to safely show what they are working on, and what their core competences are. The mediator should therefore have systems in place for companies to safely show what they need or are working on, without the fear of compromising their strategic position by giving away information to a competitor. As stated in the literature, the mediator could work as a confidante, holding important information to evaluate each SME objectively and provide other SMEs with the results of their analysis. By only providing the results of the analysis, instead of the original information, this can reduce the reservations that an organisation might have for sharing their core competences or detailed R&D information. Furthermore, this should help a mediator to actively reduce the time invested by a company to start engaging in these collaborative forms of innovation, reducing the market barriers.
Creating and actively expanding an extensive network database of technology suppliers is a key activity for a successful mediator. When partners with specific knowledge or resources are needed for a project, a mediator should try to convince them engage in this project, growing the network. Knowing, and being able to collaborate with, a variety of institutes, companies and government agencies will create more opportunities to match companies and institutes together. A network within the government agencies can create shortcuts to subsidies.

A history of successful projects may enhance trust in the mediator for newcomers. Furthermore, running projects can attract new companies. Trust is posed as an important perquisite to engage in collaborative forms of innovation. By being selective in what institutes a mediator affiliates with, by selecting only those enterprises that can be trusted, either through past experience through working with the mediator, the experience of other key partners of the mediator or general reputation, can a mediator become a reference point of companies can be trusted, for other organisations, for selecting institutes and companies to collaborate with. Furthermore, trust is the most important risk mitigation factor for collaboration risks (Coraş & Tanţău., 2013). The engagement with a mediator should eventually provide a reference point for other organisations in whether an organisation is trustworthy.

The design parameters and the role of the innovation mediator are in the interrelation design shown in figure 5-2. What can be seen here that when an innovation mediator actively increases trust among the participants, expands the network, and makes the match making and selection for easier for participants, it can reduce the collaboration risks and help to align the alliance objectives.
5.1.2. Aspect 2: The mediator as innovation and collaboration coach

A mediator fills the role of innovation coach guidance and support for partners at start, during and the ending of the project. Furthermore, the mediator can motivate firms to engage in open innovation projects. This aspect is focused on the innovation and collaboration coach role proposed by the focus group. The aim is to reduce the barriers posed by regulations and the market, reducing organizational culture / social capital barriers and reducing technological risks while directly and indirectly aligning the alliance objectives and enhancing sharing and capacity to reduce the lack of resources and costs. The design parameters used can be seen in table 5-2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Impact</th>
<th>Parameter range</th>
<th>Desired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulations and market barriers</td>
<td>Medium</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Collaboration risks</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Technological risk</td>
<td>Medium</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Organizational culture / social capital barriers</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Lack of resources</td>
<td>Medium</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Cost reduction</td>
<td>Low</td>
<td>low-high</td>
<td>High</td>
</tr>
<tr>
<td>Sharing and capacity</td>
<td>High</td>
<td>low-high</td>
<td>High</td>
</tr>
<tr>
<td>Alliance objectives</td>
<td>High</td>
<td>unaligned-aligned</td>
<td>Aligned</td>
</tr>
</tbody>
</table>

Table 5-2: Parameters design aspect 2

Network Construction

Once a match has been made the assistance that a mediator gives with setting up the cooperation projects can be very valuable. Having specific know-how in collaboration, starting a SME and how to obtain subsidy helps a SME to balance between innovation and day-to-day management. Aligning the alliance objectives at the start of the collaboration is posed as critical success factors (Hoffmann & Schlosser, 2010). Guiding the collaboration from the start is therefore important the increase the chances of a successful collaboration.

An Innovation Mediator can reduce technological risks by guiding starting projects through coaching on organizational issues, and advice on patent policy. Since a mediator can act as an impartial party that can mediate for ownership of patents and intellectual property that may be created during these projects, the can reduce the risks core knowledge flowing out to competing organizations (Lee et al., 2010).
Network management

A mediator can support the companies to by helping to obtain finance and by acquiring funding for their innovation initiatives, reducing the barriers of regulation and organizational culture/social capital. The basic know-how can help in knowing what subsidies may be available and how to apply for them, and by finding other parties that may be able to allocate funds toward a project. This can be an advisory role or a short-cut in acquiring funding (Lee et al., 2010). This can be achieved by:

- match making with other running innovation projects
- developing new innovation consortia including the financial arrangements
- providing information about project related public funding sources
- enhance sharing among participants

The design parameters and the role of the innovation mediator are in the interrelation design shown in figure 5-3. What can be seen here that when an innovation mediator actively tries to reduce the barriers, and enhance the success factor that lead to the alliance objectives, ultimately reducing the collaboration risks.
5.1.3. Aspect 3: The mediator as stimulator for knowledge and learning

Organizational culture / social capital barriers and workforce deficiencies are both strong barriers which can have a strong impact on the success of collaboration and open innovation (van de Vrande et al., 2009). According to the research by (Coraş & Tanţău., 2013), learning is one of biggest mitigation factors collaboration risks and workforce deficiencies, as can be seen in table 5-3. The design parameter used for the third design aspect are therefore focused on learning and the positive effect it can have on reducing the barriers of organizational culture / social capital barriers and the workforce deficiencies.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Impact</th>
<th>Parameter range</th>
<th>Desired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workforce deficiencies</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>Organizational culture / social</td>
<td>High</td>
<td>low-high</td>
<td>Low</td>
</tr>
<tr>
<td>capital barriers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning</td>
<td>Medium</td>
<td>low-high</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 5-3: Parameters design aspect 3

Facilitation of collaboration

Continuous learning ensures rapid adaptation to the changes in regulations affecting the open innovation agreements and a faster orientation towards sources of financing. Furthermore, by gaining more knowledge, SMEs are better able to protect their intellectual property and to reap the rewards from partnering for innovation purposes (Coraş & Tanţău., 2013).

Since the gain of knowledge is also one of the stronger incentives to adopt open innovation practices (van de Vrande et al., 2009) an innovation mediator could help to not only to directly helping in the collaboration process but also by enhancing the workforce.

ISPT, where this research was conducted, invests in their Innovation Academy. Two of the reasons they do this is to increase the attractiveness of the chemical and energy sector and recruit and develop human capital, in an effort to increasing the suitable manpower in the labour market. This may, in time, reduce workforce deficiencies.

Learning can also include educating the current workforce and enhancing the knowledge gain by open innovation. This can help to reduce the barrier of insufficient technical expertise or training of employees (Coraş & Tanţău., 2013).
The design parameters and the role of the innovation mediator are in the Interrelation design shown in figure 5-4. What can be seen here is that when an innovation mediator actively increases learning among the participants decrease the workforce deficiencies, reduce the organizational culture / social capital barriers. Increased learning, in turn, also reduces the workforce deficiencies and the organizational culture / social capital barriers.
5.2 SWOT analysis

The SWOT analysis is aimed at critically discussing the proposed design, including the proposed design aspects that are included in the design. The SWOT analysis looks at the strengths, opportunities, weaknesses and threats of the design, as can be seen in Figure 5-5. Each of these elements will be discussed.

![SWOT analysis diagram]

**Strengths**
- Better match making and selection
- Enhancing success factors
- Reduction in major barriers and risks for SMEs
- Increased customer value
- Sustaining labour market for clients
- Trusted Network

**Weaknesses**
- Dependency willingness of partners and clients
- Dependency on expertise of own employees

**Opportunities**
- Active mediator role is yet to be exploited
- Extra activities could result in more revenue sources for the mediator

**Threats**
- Organisations may decide that the mediator will not be necessary
- Technological and market uncertainty remains

**Figure 5-5: SWOT**

**Strengths**
When match making and selection is easier for organisations, they are more likely to remain in cooperation with the mediator. Furthermore, it reduces many administrative and collaboration risks. By actively enhancing success factors and reducing the major barriers and risks for SMEs, the adoption challenges are reduced, which can help in expanding the mediator’s network, and the success chances are increased, enhancing trust and the chance for a positive outcome of the project. Sustaining the clients’ labour market decreases the workforce deficiencies and creates a basis of trust with the organisation’s employees.
Weaknesses
The innovation mediator is dependent of the willingness of their partners and clients. If their management does not see the benefits of learning or feels like they do not require innovation coaching, many barriers and threats could remain. This could, in turn, also increase the collaboration risks of the other partners they may be involved with. Furthermore, the mediator has a high dependency on expertise of own employees. If certain expertise, or know how, is not insufficiently or temporarily unavailable, the mediator could lose the confidence of the network partners and lose on their core competences.

Opportunities
The innovation mediator roles proposed in the literature (Lee et al., 2010; van de Vrande et al., 2009) are not very active. Their value is described as creating environments, for firms and universities to collaborate in innovation opportunities. An active mediator that does not just brings parties together but actively guides them, directly and indirectly towards a successful cooperation is a role that is not yet fully explored. Enhancing learning and providing knowledge with regard to open innovation and collaboration can create new revenue streams in the form of masterclasses or other advisor fees.

Threats
Having profited from the knowledge and network the mediator provides, organisations may decide that the mediator will not be necessary for future projects. This may be prevented by constantly expanding the network and increasing the expertise of the mediator, and by providing services that may help to balance the daily and the innovation process. Another threat is that certain amount of technological and market uncertainty remains. The failure of a project, or when it is discontinued, for reasons outside of the mediator’s sphere of influence, may still be perceived as a fault of the mediator by the participants. This feeling may increase if the mediator is more involved in the project.
6. Discussion

This section will first into what extent the research questions proposed in the introduction of the thesis, have been answered. Then the contribution the current literature of this thesis will be discussed. This is followed the practical implications of the design, after which suggestions for the implementation of the design for innovation mediators will be discussed. Finally, the limitation and suggestions for future research will be given.

The first research question: “what are the barriers and adoption challenges for open innovation?” proved to be a more comprehensive list than first anticipated. There are many barriers not only for adopting open innovation, but also for collaboration. When looking at these barriers, it seemed that the most prominent barriers where either workforce related (low manpower, low retention, etc.), related to collaboration (quality of partners and performance, complexity, etc), or organizational culture / social capital barriers. Though lack of resources is often suggested as a “weakness” for SMEs, they themselves did not consider it an important barrier to engage in collaborative forms of open innovation.

The second research question: “does the opinion of the representatives correctly represent and influence the actions taken by senior management?” could, in case of the focus group, be answered as yes. The focus group consisted mainly of higher management of the SMEs. This may be due to the smaller scale that SMEs operate in, with regard to manpower and size. Large enterprises however would, arguably, be more inclined to send lower management to such meetings.

The third research question was; “how can the collaboration with the mediator enhance the company representatives’ opinion about collaborative forms of innovation?” This research proposes that, by reducing the barriers and enhancing the incentives, this should positively affect the opinion about collaborative forms of innovation with regard to the SMEs that are actively engaged in it. Furthermore, if a mediator enhances learning and knowledge transfer, the SMEs involved should gain benefits beyond just the cooperation. Reduction in the workforce deficiencies barriers, for example, could prove beneficial outside of open innovation projects.

The fourth research question was: “what motivates representatives of SMEs to engage in collaborative forms of innovation?” Here this study found that the need to keep up with current market developments, customers and to increase growth and/or market share is the main motivation behind adopting open innovation practices overall, as well as collaboration in open innovation. Costs reduction had a very low impact on this decision, this could be because it is seen more as a ‘means to an end’ to engage in these practices more than an initial motivator.
The fifth research question was: “how can a mediator motivate the representatives to become so-called “innovation champions”?” The critical success factors are mainly present during the start of the collaboration. The literature showed that it is important to provide quick and measurable results by starting an initial common project or task so the partners get used to working with each other and see the alliance become a reality, helping to counter the sceptics of the collaboration and improve work ethic. By making sure that finding a partner for collaboration requires as little time and effort as possible, providing ample guidance throughout the collaboration, and providing quick and measurable results should motivate the SMEs involved to remain in these collaborations.

Finally, the main research question: “how can representatives from SMEs be influenced by mediators to become willing to actively participate in collaborative forms of innovation?” is answered by through the design. When looking at direct support, a mediator can, by actively enhancing the Network Database provide SMEs with a large network of technology suppliers and extensive knowledge about the market and technology. In the Network Construction, the mediator can help reducing the effort to find partners and provide assistance by guiding collaborations during the start of the alliances, thus increasing the chances of success and decreasing collaboration and social capital barriers. Network Management can help in reducing technology and collaboration risks with regard to patents by being a middleman, and provide advice on funding, general management, taxes, laws, etc.

Indirect support includes enhancing a culture of collaboration, and facilitating collaboration. On top of the normal activities of a mediator, a mediator could collaborate with the universities in their network to provide education for their clients. Enhancing knowledge transfer and reducing workforce deficiencies. Furthermore, this may be an incentive to remain a client with the mediator even after a project is concluded.

6.1 Contributions to literature

The goal of the research is to provide insight and create the proper tools, in the form of a framework, for open innovation mediators to promote collaborative forms of innovation by decreasing the barriers to participate, enhance the incentives and success factors. The design for the conceptual framework is based on the 3 design aspects, in turn, were created by using the literature and cross referencing this with a focus group of SMEs that are engaged with an Innovation Mediator. The created design is based on 3 principles:
1. The mediator as a selection tool and match maker

SME’s have lesser resources and in the form of time and funds. An Innovation Mediator should therefore actively try to reduce the time invested by an SME in order to find a suitable project. A mediator should be a guide in starting a SME, project, and how to obtain subsidy. The network of a mediator, knowing, and being able to collaborate with, a variety of institutes, companies and government agencies will create more opportunities to match companies and institutes together. A network within the government agencies will create shortcuts to subsidies. The engagement with a mediator should provide a reference point for other organisations in whether an organisation is trustworthy. By being selective in what institutes a mediator affiliates with, by selecting only those enterprises that can be trusted, either through past experience through working with the mediator, the experience of other key partners of the mediator or general reputation, can a mediator become a reference point if companies can be trusted.

2. The mediator as innovation and collaboration coach

Supporting organisations by providing coaching on organizational issues, and advice on patent policy, creates a basis of collaboration and trust. A mediator fills the roll of innovation and collaboration coach guidance and support for partners at start, during and the ending of the project. The aim is to reduce the barriers posed by regulations and the market, reducing organizational culture / social capital barriers and reducing technological risks while directly and indirectly aligning the alliance objectives and enhancing sharing and capacity to reduce the lack of resources and costs. When looking at the proposed design, the mediator has been given a very active role. This is in contrast with the business model configuration proposed by Lopez-Vega & Vanhaverbeke (2010) when creating a typology of intermediaries. While they propose that Innovation Mediators create value through creating environments and providing facilities for firms and universities to collaborate in innovation opportunities, this research shows that there is a need among SMEs for an Innovation Mediator that is more active in guiding their Innovation and collaboration efforts.

3. The mediator as stimulator for knowledge and learning

Continuous learning ensures rapid adaptation to the changes in regulations affecting the open innovation agreements and a faster orientation towards sources of financing. Furthermore, by gaining more knowledge, SMEs are better able to protect their intellectual property and to reap the rewards from partnering for innovation purposes (Coraș & Tanțău., 2013). Since the gain of knowledge is also one
of the stronger incentives to adopt open innovation practices (van de Vrande et al., 2009), an innovation mediator could help to not only to directly helping in the collaboration process but also by enhancing the workforce.

6.2 Practical implications

First mediators should actively try to reduce the effort of selection and match making for SMEs. SMEs have lesser resources and in the form of time and funds. An Innovation Mediator should therefore actively try to reduce the time invested by an SME in order to find a suitable project. A mediator should be a guide in starting a SME, project, and how to obtain subsidy. The selection tools currently available seemed to be insufficient. As described by (Lee et al., 2010) the intermediary can hold important information to evaluate each SME objectively and provide other SMEs with the results of their analysis. By only providing the results of the analysis, instead of the original information, this can reduce the reservations that an organisation might have for sharing their core competences or detailed R&D information. Such a system can reduce effort of selection and match making for SMEs.

Secondly innovation mediators should be active in their role as innovation and collaboration coach. This research shows that there is a need among SMEs for an Innovation Mediator that is more active in guiding their Innovation efforts. Innovation Mediators can actively reduce many risks and barriers for SMEs to engage in collaborative forms of open innovation while reducing the time spend on starting projects.

Lastly, mediators can benefit by actively engaging in educating the workforce of SMEs and new potential labour. Continuous learning ensures rapid adaptation to the changes in regulations affecting the open innovation agreements and a faster orientation towards sources of financing. Furthermore, by gaining more knowledge, SMEs are better able to protect their intellectual property and to reap the rewards from partnering for innovation purposes. Learning is one of the main mitigating factors for workforce deficiencies. A mediator should therefore use their network to establish contact with universities to provide education.
6.3 Implementation

Selection tool and match maker

Lack of trust and the risks involved with sharing a SME’s core competences are a major barrier for openly discussing collaboration. However, this is of importance, since companies view alliances as instrument to implement strategies and achieve strategic goals. The planning for deciding to cooperate should therefore be derived of the business strategies of the companies involved. This analysis should evaluate if and how an alliance can improve the company’s strategic position in their particular business (Hoffmann & Schlosser, 2010).

As stated in design aspect 1, the mediator could work as a confidante, holding important information to evaluate each SME objectively and provide other SMEs with the results of their analysis. By only providing the results of the analysis, instead of the original information, this can reduce the reservations that an organisation might have for sharing their core competences or detailed R&D information.

Innovation and collaboration coach

For a mediator to become an innovation and collaboration coach, it needs to both reduce risks and barrier that are connected to collaboration and open innovation, and enhance the critical success factors.

Technological risks can be reduced by coaching on organizational issues, and by providing advice on patent policy. Being a mediator for ownership of patents and intellectual property, the mediator can reduce the risks of core knowledge flowing out to competing organizations (Lee et al., 2010).

The critical success factors are mainly present during the start of the collaboration (Hoffmann & Schlosser, 2010). Therefore, the mediator should be actively engaged during the starting phase of the collaboration. A successful alliance often depends if the behavioural uncertainty is as low as possible, resulting in a lower need of control. The mediator should help in establishing precise targets and task definitions to avoid conflicts (precise definition of right and duties). Since, a company seeking a successful alliance must contribute individual strengths and look for complementary, or similar, resources (Hoffmann & Schlosser, 2010), this also includes agreements on whether the input factors (resources) remain the property of each player or if they become mutually shared, during and of the collaboration.

Furthermore, it is important to provide quick and measurable results by starting an initial common project or task so the partners get used to working with each other and see the alliance become a reality (Hoffmann & Schlosser, 2010). This can help to counter the sceptics of the collaboration and improve work ethic.
Stimulating knowledge and learning

To the answer of how one might implement the last design aspect, the way ISPT has accomplished this might provide as a good example. ISPT, where this research was conducted, invests in their Innovation Academy. Furthermore, they provide education through an interuniversity school in the area of Chemical Engineering and Process Technology. OSPT is part of the Innovation Academy of ISPT where they offer (post graduate) education- and research activities of the collaborating research group of the five universities they are engaged with.

This provides an example of using the established network for not only collaboration with regard to open innovation, but using to enhance learning to increase the attractiveness of their sector and recruit and develop human capital, in an effort to increasing the suitable manpower in the labour market.

6.4 Limitations and future research

There are certain limits to this study, the first of which is that there has not been any feedback on the end-design by the interviewees. This has not been done due to time constraints. One, or several, rounds of feedback could have made the design more relevant. The final design, however, does give a good representation for how an active Innovation Mediator can reduce barriers and make collaborative forms of open innovation more appealing for SMEs. Therefore, the work still contributes to literature and business practises.

The second limit is that no SMEs participated that were not and have never been involved with innovation intermediaries, but do (wish to) engage in collaborative forms of open innovation. Though the focus group meeting result showed that the mediator could reduce certain barriers, they could be biased because of their connection to the mediator. SMEs that engage, or want to engage, in collaborative forms of open innovation without an Innovation Intermediaries should in most cases encounter more barriers and have more risks. Further research should therefore look at the differences in perceived barriers and risk between SMEs that engage with Intermediaries and SMEs that do not.

Third, the study is not backed by any quantitative results due to time constraints. A quantitative study based on the reasons of the SMEs for joining, cooperating and even leaving a mediator could provide insight in what barriers, perceived risks and incentives are more strongly apparent compared to each other. Further research should provide quantitative results to increase validity.

The fourth and last limitation is that the research could only be conducted at one innovation mediator. Comparing different mediators could provide insights in different Business Models designs and
their benefits and drawbacks. The focus group can be biased for only being familiar with how ISPT it operates as an innovation mediator, basing their opinion on collaborative forms of Innovation only on these experiences.

Further research should provide a quantitative based insight for the developing role of Innovation Mediators. Furthermore, more research can be done to show the differences between passive and active mediators. Lastly, the research could have a more varied pool of SMEs from different types of market segments.
Works Cited


A. Appendix: Tables

<table>
<thead>
<tr>
<th></th>
<th>Inbound Innovation</th>
<th>Outbound Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>pecuniary</td>
<td>1. Acquiring</td>
<td>3. Selling</td>
</tr>
<tr>
<td>non-pecuniary</td>
<td>2. Sourcing</td>
<td>4. Revealing</td>
</tr>
</tbody>
</table>

Table A-1 Structure of different forms of openness (Dahlander and Gann, 2010)

1. Acquiring
This type of openness refers to acquiring input to the innovation process through the market place. Following this reasoning, openness can be understood as how firms license-in and acquire expertise from outside.

2. Sourcing
This type of openness refers to how firms can use external sources of innovation. Chesbrough et al. (2006) claim that firms scan the external environment prior to initiating internal R&D work. If existing ideas and technologies are available, the firms use them. Accounts of corporate R&D laboratories show that they are vehicles for absorbing external ideas and mechanisms to assess, internalize and make them fit with internal processes (Freeman, 1974).

3. Selling
This type of openness refers to how firms commercialize their inventions and technologies through selling or licensing out resources developed in other organization.

4. Revealing
This type of openness refers to how internal resources are revealed to the external environment. In particular, this approach deals with how firms reveal internal resources without immediate financial rewards, seeking indirect benefits to the focal firm.

(Dahlander and Gann, 2010)
<table>
<thead>
<tr>
<th>Categories</th>
<th>Innovation consultant</th>
<th>Innovation trader</th>
<th>Innovation incubator</th>
<th>Innovation mediator</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Value proposition</strong></td>
<td>N: Coordinate IP, and licenses databases and relationships with universities to provide technology in-sourcing, licensing, and commercialization services</td>
<td>N: Create and enlarge a community of solution providers and firms to: 1) enable match of solution providers and seekers, 2) facilitate networks of inventors to gather, redefine and commercialize inventions</td>
<td>L: Establish physical spaces to connect university outputs with company requests; Identifies scientific or technological opportunities for universities, firms, entrepreneurs</td>
<td>N: Create environments for firms and universities to collaborate in innovation opportunities initiated entrepreneurs, users</td>
</tr>
<tr>
<td></td>
<td>E: Provide innovation processes or tools to address innovation problems relying on a community of consultants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Value chain</strong></td>
<td>Scanning and information processing; intellectual property; commercialization</td>
<td>Gatekeeping and brokering; scanning and information processing; intellectual property</td>
<td>Knowledge processing, generation and combination; intermediates between science policy and industry; testing, validation and training</td>
<td>Creates spaces for knowledge processing, generation and combination; intermediaries between science policy and industry; demand articulation; testing and validation</td>
</tr>
<tr>
<td><strong>Market segment</strong></td>
<td>Large companies; SMEs; research institutes; local governments; investors</td>
<td>1) Firms in search for scientific or technical solutions; 2) scientists; retirees</td>
<td>University institutes and R&amp;D organizations; start-ups; service providers</td>
<td>Large organizations; SMEs; entrepreneurs; research institutes; service providers</td>
</tr>
<tr>
<td><strong>Value network</strong></td>
<td>Integrate technological capabilities and market needs; advice specific license and brokering activities</td>
<td>Attempts to set up the conditions for innovation seekers and solvers to solve problems</td>
<td>Connection of university research and firms; creation of a technological or non-technological ecosystems</td>
<td>Creates to identify opportunities and commercialize technologies</td>
</tr>
<tr>
<td><strong>Competitive strategy</strong></td>
<td>Competes providing: access to a network of Innovation</td>
<td>Competes leveraging an Extensive community of</td>
<td>Competes providing technological services; Establishing relationships</td>
<td>Competes enabling: cooperative projects based on shared interests; spaces for</td>
</tr>
</tbody>
</table>
resources e.g. patent databases or experts; methods and processes for conceptual thinking

scientists, national labs and an established community of firms

among diverse sectors

collaborative innovation projects; ecosystems for user involvement in early stage technologies

**Revenue model**

Consultancy fees, selling of software; bonus on results

Fee for solved innovation problems; posting challenges

Public grants; technology testing; private/entrepreneurial projects

Rents from spaces; public or private funding

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**Table A-3** Barriers to innovation in SMEs compared to large firms (Lee et al., 2010).

<table>
<thead>
<tr>
<th>Innovation barriers</th>
<th>SMEs</th>
<th>Large firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ranking</td>
<td>Score</td>
</tr>
<tr>
<td>Difficulties in finding suitable manpower in a labour market</td>
<td>1</td>
<td>3.12</td>
</tr>
<tr>
<td>Short of suitable manpower within the firm</td>
<td>2</td>
<td>3.10</td>
</tr>
<tr>
<td>Market uncertainty in innovative products</td>
<td>3</td>
<td>3.00</td>
</tr>
<tr>
<td>Imitation possibilities of technology innovation</td>
<td>4</td>
<td>2.95</td>
</tr>
<tr>
<td>Short of ability in R&amp;D planning and management</td>
<td>5</td>
<td>2.91</td>
</tr>
<tr>
<td>Lack of technological information</td>
<td>6</td>
<td>2.87</td>
</tr>
<tr>
<td>Funding difficulties due to high risk from technological uncertainty</td>
<td>7</td>
<td>2.85</td>
</tr>
<tr>
<td>Funding difficulties due to high innovation and commercialisation costs</td>
<td>8</td>
<td>2.79</td>
</tr>
<tr>
<td>Lack of market information</td>
<td>9</td>
<td>2.78</td>
</tr>
<tr>
<td>Frequent turnover human resources (usually for R&amp;D)</td>
<td>10</td>
<td>2.66</td>
</tr>
<tr>
<td>Difficulties in using external services (technology and business services)</td>
<td>14</td>
<td>2.49</td>
</tr>
<tr>
<td>R&amp;D department without power</td>
<td>16</td>
<td>2.37</td>
</tr>
<tr>
<td>Monopolistic or oligopolistic market structure</td>
<td>18</td>
<td>2.33</td>
</tr>
<tr>
<td>Funding difficulties due to delayed payment by customers</td>
<td>23</td>
<td>2.02</td>
</tr>
<tr>
<td>Needlessness of additional innovation</td>
<td>25</td>
<td>1.97</td>
</tr>
</tbody>
</table>

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*a* The maximum value for ‘Score’ is 5.

*b* The range of ranking is 1–26. Texts in bold indicate the top 10 innovation barriers.
B. Appendix: Figures

Figure B-1 Design Aspect integrated