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## 1 Introduction

This section offers a brief presentation of the topic concerning this thesis. It explains the initial situation of Open Innovation and the motivation for this research in that context. Then, it states the objectives and structure of this thesis.

### 1.1 Initial situation

Open Innovation (referred as ‘OI’ in this thesis) means opening the boundaries of a company’s innovation process to external ideas, knowledge and paths to market (Chesbrough 2006, p. 43). To approach this external knowledge landscape, a firm can establish relationships with external stakeholders, such as customers, users, suppliers, etc. (Gassmann & Enkel 2004, p. 2). These inflows and outflows of information can provide the company with many benefits, e.g. increase in the efficiency, generation of other sources of income (for instance, projects that cannot be developed internally can be sold or out-licensed), and information advantage towards the competence (Braun 2012, pp. 9,10). This opening can also involve some risks to the company, such as knowledge drain (Enkel et al. 2005, p. 205). But there are still some fields in which industry requires support. Opening up the innovation process needs new and adapted management methods (Gassmann 2006, p. 226). Accordingly, Gürtler et al. (2014b, p. 1029) identified the general managing and planning of an OI-project as especially challenging for companies.

Responding to these industry demands, (Gürtler & Lindemann 2013) present the *Situative Open Innovation* model. It is a step-to-step guideline to the planning of an OI-project in a company. It consists in the analysis of the current situation of the company, the selection of OI-partners and OI-methods, and finally the detailed planning of its implementation. The role of the external actors in this model is crucial. Partners determine the input gained by the company through an OI-project. Therefore, the selection of the right partner is decisive to the success of the OI-project. But so far, few partner search approaches regarding Open Innovation are found in the literature, e.g. (Belz & Baumbach 2010), (Hippel 2006), (Gürtler 2015). Thus, the aim of this research is to investigate about these search approaches.

### 1.2 Motivation

The choice of the right OI-partner is very determining for the success of an OI-project (Gassmann & Enkel 2004, p. 13). But this is still a challenge for firms (Gürtler et al. 2014b, p. 1028). Regarding OI, partners should be chosen by their technical skills (potential to contribute with solutions) and strategic skills (influence in the success of the project). So far, only partial approaches have been identified: they only assess the technical or the strategic abilities of potential partners (Gürtler 2014, p. 57). Therefore, a holistic method for the identification and search for suitable innovation partners integrating both perspectives is

needed. With the *Situative Open Innovation* model, Gürtler and Lindeman (2013) propose an approach to select OI-partners that combines elements from Lead-User identification (covering the technical perspective) (Hippel 1986) and stakeholder analysis (strategic perspective) (Mitchell et al. 1997). But these are not the only existing approaches regarding the selection of partners. Therefore, this research aims to gather the existing approaches in the literature regarding partner selection to adapt them (if necessary) and implement them into the *SOI* model. This will enhance the available tools and methods to implement *SOI*, specifically regarding the selection of OI-partners. It will then provide companies with more resources to apply OI with the support of specific guidelines.

### 1.3 Objectives of the thesis

The main goal of this thesis is to find innovation-partner search approaches. The found approaches will be assessed regarding their suitability in Open Innovation, and then adapted to their implementation into *SOI*. This will respond to the demands from industry for a methodical support in finding partners for OI.

The main questions stated for this research are:

- How can a firm identify suitable partners for OI collaboration within all SH/people and firms involved in the innovation process?
- Are there specific approaches for specific type of partner?
- What are the requirements for an “**OI-partner search approach**”?
- How can search approaches be looked for in a methodical system?
- How can these approaches be assessed regarding OI in order to classify them?
- How can these OI partner-search approaches be implemented by firms?

## 1.4 Structure of the thesis

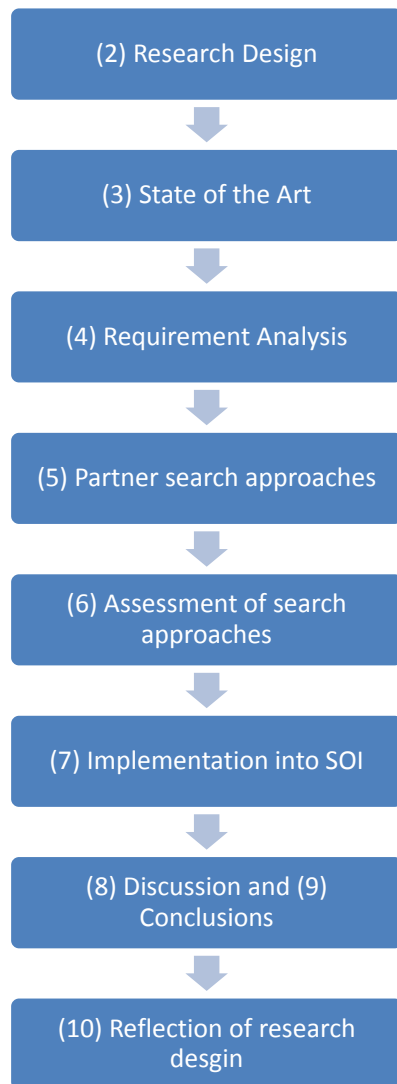


Figure 1-1: Structure of the thesis

The overall structure of this thesis is represented in Figure 1-1. In it, each step in the diagram includes the chapter number between brackets. The thesis starts presenting the Research Design in Section 2. Then, Section 3 gives an overview about the State of the Art of Open Innovation and Situative Open Innovation, followed by a Requirement Analysis for the search approaches in Section 4. Then, Section 5 presents the Research methodology that has been followed to look for search approaches, and the results of the search (Identified search approaches). Section 6 explains the Assessment methodology used to assess a search approaches regarding its suitability in Open Innovation, and then presents the Assessment of the identified search approaches. In Section 7 overviews the Implementation into Situative Open Innovation of the approaches. The results are discussed in Section 8, followed by the Conclusions in Section 9. Finally, Section 10 will present the Reflection of the research design.



## 2 Research Design

The main goal of this research is to seek for methods or approaches to find, select and/or assess potential Open Innovation partners. To that end, it takes a look in the existing literature about OI partner selection. This field has still not been deeply investigated. Thus, the search is enhanced to partner selection for different kind of alliances. Then their adaptation to an OI context will be considered.

**How can a firm identify suitable partners for OI collaboration within all SH/people and firms involved in the innovation process?** This research will seek through the literature for search approaches that look for partners to establish OI collaborations.

**How can SH be categorized? Are there specific approaches for specific type of partner?** Different types of SH can require different approaches to reach them. To that end, first the types of partner have to be identified.

**What are the requirements for an “OI-partner search approach”? From where can they be derived?** A set of requirements for a search approach are proposed. They represent the characteristics of the ‘ideal’ search approach, considering different aspects of a search. In fact, four types of requirements are differentiated: requirements from OI characteristics; for reducing risks; with regard to the company and for approach efficiency. Therefore, these requirements are what the research should look for in a search approach.

**How can search approaches be looked for in a methodical system?** A methodical way to search through the literature is established. According to the main concept of OI, there is plenty of useful knowledge outside a firm. But what it is not stated is *where* is this knowledge. For that reason, this thesis proposes to review search approaches all kinds of stakeholders. To minimize the overlooking of any possible partner a ‘Partner structuring’ table is used. This table tries to enclose all the company’s possible stakeholders. These are individuals or firms that are somehow related to the focal company. The result is a table with different kinds of partners to whom the firm has access. It will be used to derive different search terms and look for partner search approaches with them.

Using the table as a tool, the research consists in systematically derive search terms and use them in various search engines (*Google Scholar, Scopus, Web of Knowledge, etc.*) to review the results looking for suitable approaches for Open Innovation partners. A total of 39 approaches are presented in this thesis.

**Are there any recurrent methods within these approaches?** Six types of search are identified: Open Search; Network-based Search; Open call Search; Database Search; Pool-based Search and Algorithm-based Search. To better analyze and compare the search approaches, a particular profile is fulfilled for each of them presenting their main characteristics. Overall, this thesis provides with 39 sheets representing different kind of search approaches, to use or to study their adaptation into *Situative Open Innovation*.

**How can these approaches be assessed in order to classify them?** The search approaches will be assessed in regard of their suitability to be used as OI-partner search methods. The

list of requirements is used as evaluation criteria to see if the identified approaches truly fulfill them. Each of them will be assessed as completely, partly or not fulfilled.

**How can these OI partner-search approaches be implemented by firms? How can a firm choose/decide what approach to implement?** Their possible implementation into *Situative Open Innovation* will be studied. The approaches are classified into the different stages of the SOI partner search, and a selection strategy is proposed to decide the most suitable approach.

### **3 State of the Art**

In this section, a brief introduction to Open Innovation (OI) is given. First, it presents an overview of what is Open Innovation and its types. Also, the potential benefits and challenges that can result when applying OI into a company are explained. Then, subsection 3.2 introduces a methodical guideline to support the implementation of OI: *Situative Open Innovation* (Gürtler et al. 2013).

### 3.1 Open Innovation

Open Innovation (from now on abbreviated as ‘OI’) was first introduced by (Chesbrough 2003). The basic idea of OI is that firms should not only use their own ideas and knowledge, but open the innovation process to possible external expertise and viewpoints (Chesbrough 2006, p. 43). It stands as the antithesis of the traditional model. For this, Chesbrough (2006) uses the term ‘Closed Innovation’ to better explain OI. ‘Closed Innovation’ consists in the research, development, production and service of products “*all within the four walls of the company*” (Chesbrough 2006, p. 4). The transition from this ‘Closed Innovation’ model to the OI model can be seen depicted in Figure 3-1. The figure depicts the ‘Closed Innovation’ paradigm, where the whole development takes place within the boundaries of the firm. On the contrary, Figure 3-2 illustrates the OI paradigm (Sloane 2011, p. 6). As can be seen in Figure 3-2, in OI the innovation process is treated as an open system that allows inflows and outflows of information. In other words, OI lets “*purposively managed knowledge flows across the organizational boundary to accelerate internal innovation, and expand the markets for external use of innovation*” (Chesbrough et al. 2014, p. 43).

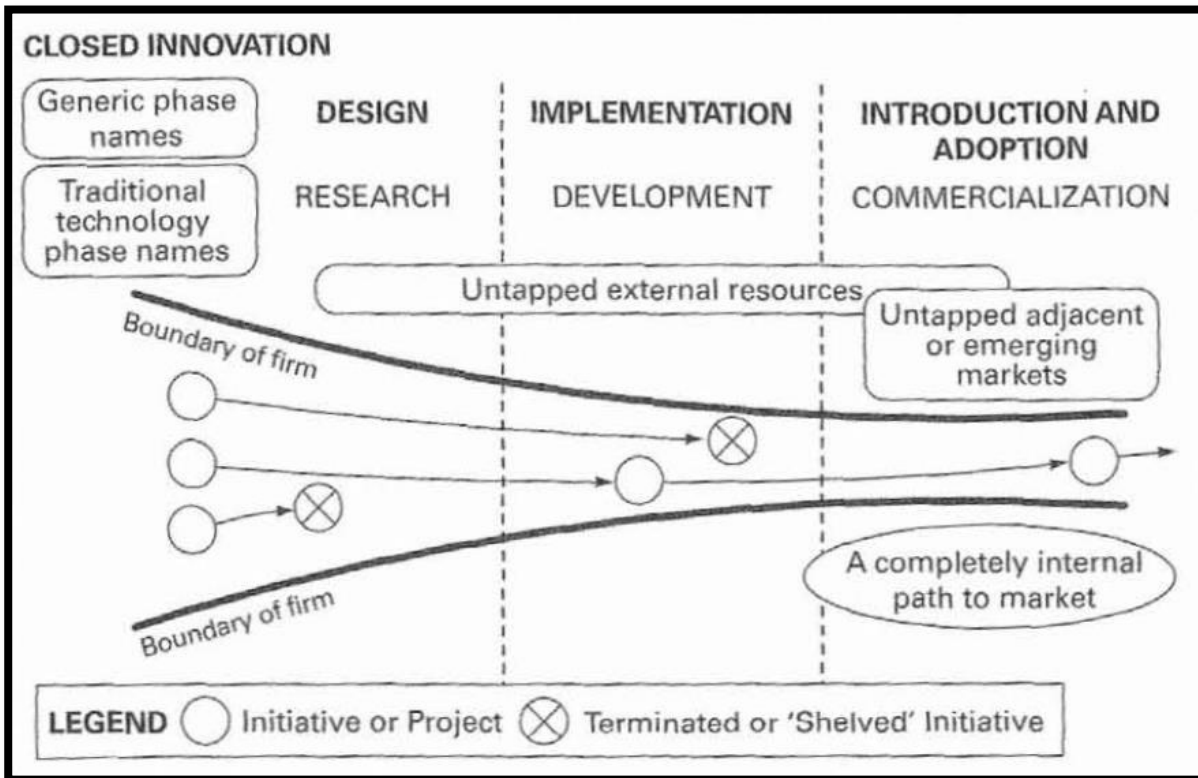


Figure 3-1: Closed Innovation (Sloane 2011, p. 6)

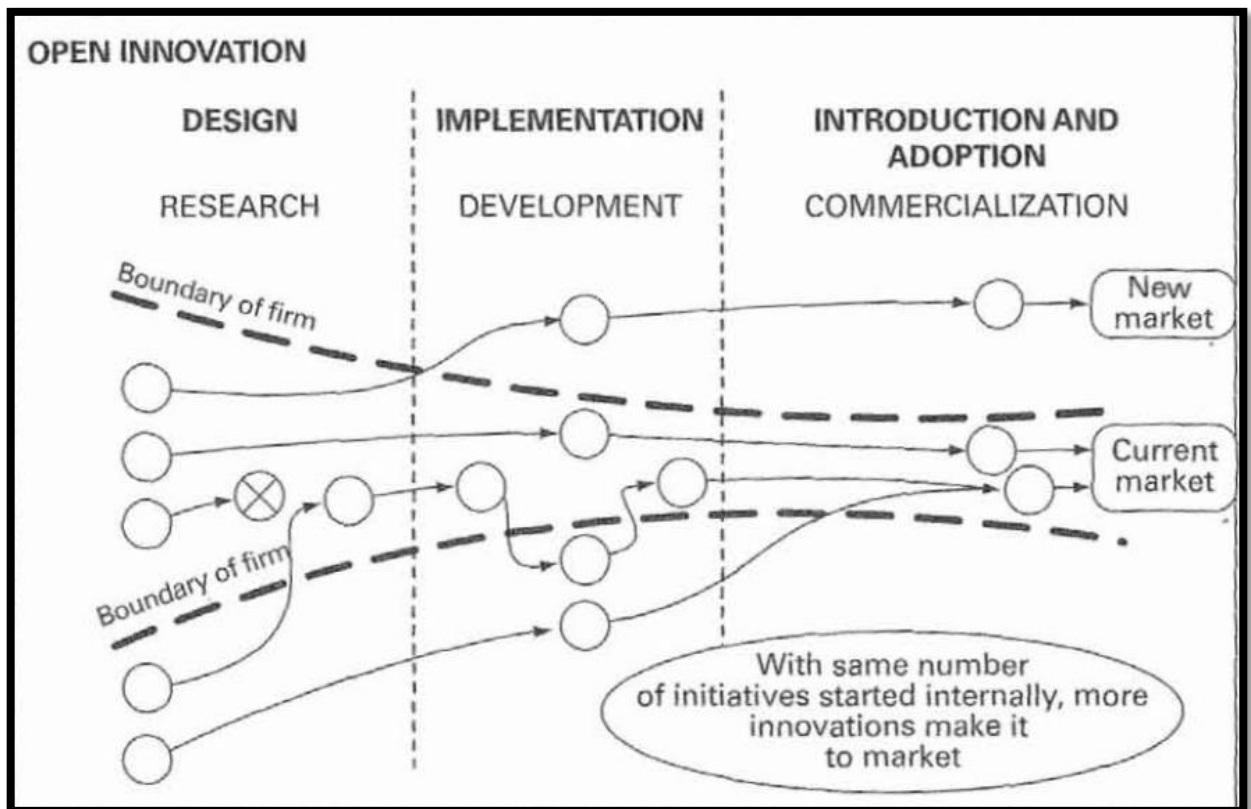


Figure 3-2: Open Innovation (Sloane 2011, p. 6)

However, the profiting of this external knowledge does not only mean the integration of external knowledge into the firm. Depending on the direction of the knowledge flow, three types of OI have been distinguished by (Gassmann & Enkel 2004, p. 6):

- (1) **Outside-in innovation:** available knowledge from outside the company is included within the innovation process to develop new products or improve the existing ones. This external information can be gained through e.g. customer and supplier integration, buying intellectual property, investing in global knowledge creation, etc.
- (2) **Inside-out innovation:** specific knowledge or innovation of the company (such as patents or technology licenses) is brought to the company's environment to enable its further external development and generate extra profit. Otherwise, this idea would not be developed in the company and therefore not produce any final products nor revenue.
- (3) **Coupled innovation:** combination of outside-in and inside-out innovation. Companies normally co-operate with other companies in strategic networks to do both.

The **main benefit** of OI is to enhance the sources of information and knowledge that can be used through the innovation process (Piller & Ihl 2009, p. 10), (Gürtler 2015, p. 1026). This is due to the increasing diffusion of information distribution. It implies that a firm can benefit from readily available expertise to choose from (Chesbrough 2006, p. 6). Therefore, "good research practice" is no longer exclusively inventing new knowledge, but it now includes accessing and integrating external knowledge (Chesbrough 2006, p.51). OI offers the possibility of diversifying the sources of ideas and perspectives by collaborating with a

more diverse team (Sloane 2011, p. 7). This is achieved by involving OI-partners who are related in different ways to the firm, such as universities, users, suppliers, other firms in the field, etc. (Gassmann & Enkel 2004, p. 2).

Even the mentioned benefits, major challenges can come along when implementing OI in the innovation process of a company. Gürtler et al. (2014b) identified the following industry demands and research gaps after conducting a study and a workshop:

- **Deciding if OI is suitable for a specific issue:** companies requested decision criteria to determine when to use OI (if they should implement OI at all, and for what phases it would be suitable. The success of an OI-project also depends on the suitability of the project to integrate external actors and knowledge (Enkel et al. 2005, p. 212).
- **Analysing boundary conditions which influence or constrain OI:** all internal and external factors that can somehow affect OI should be taken into account.
- **Preventing uncontrolled knowledge drain:** companies tend to protect internal information and data. But the integration of external partners inevitably involves the risk of losing knowhow (Enkel et al. 2005, p. 205). To minimize this risk, companies have to find the balance between publishing ‘as less information as possible’ but ‘as much as necessary’.
- **Identifying and selecting suitable partners:** it is a great challenge for companies to choose the most suitable partner/s among a pool of them.
- **Selecting suitable OI-methods:** companies request a guideline or criteria to decide what type of OI-method should be used in each specific situation.
- **Selecting appropriate incentive strategies for specific partners:** why would a person or entity collaborate with the company (West & Gallagher 2006, p. 321)? It is a challenge for companies to establish specific incentives to motivate external partners.
- **Embedding the OI-project or OI in general within the company:** companies presented problems in the utilization of the OI-input obtained. This input still has to be processed to enable its use. Also, employees have to be motivated to use this external knowledge, to avoid the ‘Not-Invented-Here’- syndrome (Katz, Allen 1982). It consists in the rejection of external input, considered less valuable or even a threat.
- **Assessing and controlling the success of OI-methods and OI-projects:** the communication of the benefits is important for both long-term and short-term application of OI. This is critical to control the OI-project as well as to motivate the OI-team.
- **Guideline how to handle external, inherent intellectual property rights:** companies are unsure about how to legally treat the knowledge/input gained through external sources.

These risks are often caused by an insufficient methodical support (Gürtler 2015, p. 1), specifically regarding to the management of OI- partners. An Open Innovation-partner is defined as “*any (internal and external) individual, group or organization which is involved in the Open Innovation project*” (Gürtler & Lindemann 2013, p. 2). The selected partner defines the knowledge gained by the company, but can also cause risks such as loss of knowhow (Gürtler 2015, p. 1). Therefore, the integration of the right partner is key to success of the OI-project (Gassmann & Enkel 2004, p.13). Van der Vrande (2009, p. 435)

identifies the interaction and collaboration with external partners as the main barrier for OI in Small and Medium Enterprises (SMEs). Thus, holistic performance measures are needed beyond the case studies currently found in literature (Huizingh 2010, p. 6).

So far, only partial approaches to select OI- partners can be found in literature. They only cover specific aspects of the OI-partner search. Therefore, there is no holistic methodology to select and integrate suitable partners into an OI-project (Gürtler & Lindemann 2013, p. 3). To cover this demand, Gürtler and Lindemann (2013) developed **Situative Open Innovation** (OI). It is a methodical framework to support the analysis of the company's situation, and then derive suitable partners and integration strategies.

### 3.2 Situative Open Innovation

Responding to industry demands, Gürtler and Lindeman (2013) present the *Situative Open Innovation* model. This model supports a company in the planning of an OI-project.

The *Situative Open Innovation* model provides for a methodical guideline to support companies planning an OI-project. It covers many challenging aspects concerning OI: the analysis of their internal and external situation, the selection of suitable external actors as well as the strategy to involve them in the innovation process, etc. (Gürtler et al. 2013). As can be seen in Figure 3-3, it consists in a 5-step methodology that is explained in more detail in the following sub-sections. The steps be performed sequentially, in the order presented in the Figure 3-3, but it also allows iterations between the phases if the circumstances change over time (acquisition of new information, changes in boundary conditions, etc.) (Gürtler et al. 2014, p. 2).

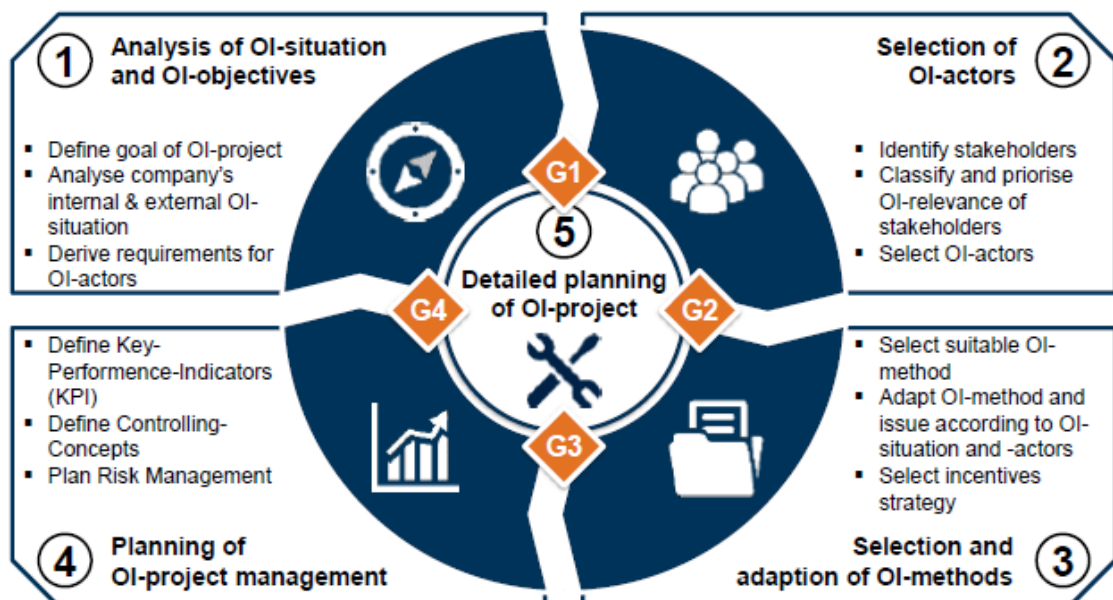


Figure 3-3: Situative Open Innovation (Gürtler, 2015)

### 3.2.1 Analysis of situations and objectives

The OI-goal is defined in this step. An analysis is performed to determine the company's situation in terms of company's characteristics, environment and Open Innovation experience (Gürtler et al. 2014, p. 4). The requirements towards OI-actors are derived, and will act as constraints in the search for external partners performed in the next step (Gürtler & Lindemann 2013, p. 5).

### 3.2.2 Selection of OI-actors

The goal in this phase is to select the most relevant partners in regard of the OI-project. It consists in the identification, assessment and ranking of all the potential OI-actors. It aims to provide with a holistic analysis of potential OI-partners, combining a **strategic** and a **technical** perspective (Gürtler 2015, p. 63). The strategic perspective analyses the influence or impact of a partner on the success of an OI-project, while the technical perspective assesses its potential contribution to a solution.

So far, only partial approaches have been described in literature, e.g. Lead-User identification (Hippel, 1986), which only analyses potential OI-actors by their technical attributes. The *Situative Innovation model* initially proposes a more holistic approach combining **Lead-User identification** (overview of the technical skills) with **stakeholder analysis** (overview of the strategic skills) (Mitchell et al. 1997).

**Lead-Users** are those users who present two main characteristics: they present customer needs before the majority of users within the market, and additionally have the know-how to provide with a solution to those need (Hippel 1986, p. 796). It can be then largely useful to collaborate with them, even though there is a risk of false Lead-User identification (Gürtler, 2015, p. 2). Different methods can be found regarding their identification:

- **Screening** (general assessment of potential partners within an existing pool of users) (Hippel 2006, p. 884)
- **Pyramiding** (iteratively asking an expert in the field about someone with a larger knowledge) (Hippel 2006, p. 886)
- **Broadcast search** (self-selection of users by responding to a public invitation) (Ili 2010)
- **Netnography** (analysis of a whole community) (Gürtler et al. 2015, p. 2)

On the other hand, **stakeholder analysis** can also support the identification of potential OI-partners. Stakeholders are "*any group or individual who affects or is affected by a company*". They are identified and characterized regarding their dependencies, avoiding missing out any relevant OI potential actors (Gürtler et al. 2013, p. 2).

These two approaches are complementary in the OI-partner selection context: Lead-Users normally are potential OI-partners who can contribute to the project with new ideas or solutions in respond to a specific task, while stakeholders are expected to provide with advice and strategic support (Gürtler et al. 2015, p. 3). The previously mentioned approaches are here integrated to a more complete selection of partners: elements of Lead-User identification are used to the global search of potential partners, and an assessment based on stakeholder analysis determines their suitability towards the OI-project. However, SOI only considers a limited set of the existing partner-search methods. The aim of this



research is to look for more partner search approaches suitable to be implemented or adapted into SOI.

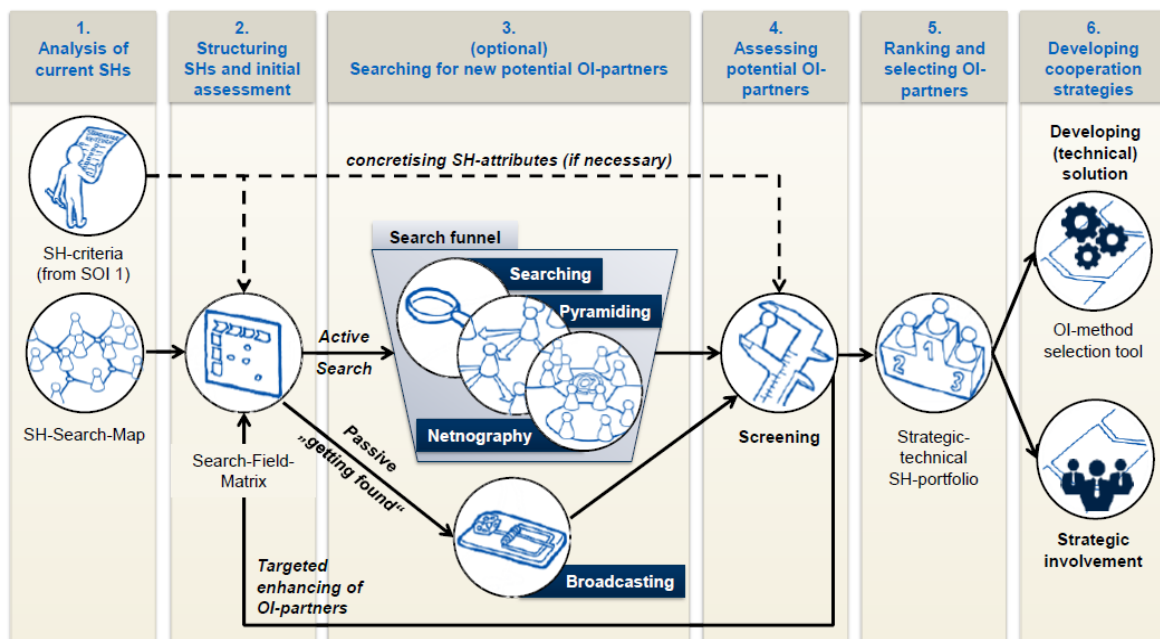


Figure 3-4: Partner search (Gürtler et al. 2015)

As depicted in Figure 3-4, five sub-steps have been differentiated for the partner selection in SOI (Gürtler 2015, p. 3):

- (1) **Analysis of current and intended state:** initial analysis of the current state of all internal and external stakeholders. The company also defines the attributes they expect from an OI-partner, which will act as requirements in the partner search. They have to enclose both technical and strategic attributes.
- (2) **Definition of search directions:** identified stakeholders are set up in a *Domain Mapping Matrix (DMM)* with domains such as innovation process phases and types of stakeholder interactions (Gürtler 2015, p. 4). It is used to recognise interactions between stakeholders and, combined with the established constraints set in *SOI 1*, to get an overview of where new OI-actors could be found (“white fields”).
- (3) **Identification of new potential OI-actors:** through an active or passive search within the defined search fields, new possible partners are identified. Here specific methods used in Lead- User identification can be applied, e.g. Netnography.
- (4) **Assessment of OI-actors:** the suitability of potential OI-actors is analysed. A general analysis is first performed regarding the fulfilment of the established requirements. Then, the most relevant potential partners are assessed in more detail. Here is to be taken into account if the number of partners found meets the number of partners. If it is not the case, iteration to the whole selection process can be made.
- (5) **Ranking and selection of OI-partners:** with the previous assessment, a ranking is developed to find the most relevant actors, and therefore select those with whom the company is interested in collaborating.
- (6) **Developing cooperation strategies:** specific strategies are chosen or adapted to collaborate with the chosen partner. The strategy has to be compatible with the

company's OI-situation characterised in *SOI 1*. Otherwise the collaboration is not possible, and a different partner or a different strategy has to be selected.

### **3.2.3 Selection and adaption of OI-methods**

This phase selects the most suitable OI-method, making the adjustments needed to fit the OI-situation and –actors, as well as determines incentive strategies if needed. It is important here again to evaluate the selected method regarding the OI-situation first analyzed.

### **3.2.4 Planning of OI-project management**

This phase defines the controlling factors that will allow an efficient project management, like key-performance-indicators.

### **3.2.5 Detailed planning of OI-project**

In this phase, a more accurate planning of the OI-project is programmed, regarding specific characteristics (such as dates but also particular measures to e.g. risk management).

## 4 Requirement Analysis

This section's goal is to state the requirements to be fulfilled by the OI-actor-search-approaches. Requirements are statements that identify the characteristics or constraints of a process (SEBoK). A requirement analysis has been performed to derive the requirements for an innovation-partner search approach. Through the requirement analysis, the characteristics and constraints of a partner search approach are defined, which can be seen in Figure 4-1.

This research has used a list of actor analysis requirements from (Gürtler et al. 2013, p. 8). It consisted in a list of expected characteristics from an OI-partner. As this research looks for partner search approaches, they have been adapted and used as attributes an approach should satisfy with regard of identifying partners. As Figure 4-1 shows, they are structured in four types of requirements. They are formulated as to complete "An innovation partner search approach should..." with the aim of being unambiguous and directly testable.

1	<b>General requirements from OI characteristics</b>
1.1	Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities
1.2	Provide an overview of the strategic relevance of the potential partners
2	<b>Requirements for reducing risks</b>
2.1	Analyse the motivation and/or interests of potential partners in cooperating
2.2	Not require the publication of internal information, to prevent knowledge drain
2.3	Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only
2.4	Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable
2.5	Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation
3	<b>Requirements with regard to the company</b>
	The approach must allow and support the company to ...
3.1	... have a disclosure competence
3.2	... have an absorptive competence
3.3	... have an integration competence
3.4	... have the competence to maintain control over a project
3.5	... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners
4	<b>Requirements for approach efficiency</b>
4.1	Contain a detailed step-by-step process description
4.2	Look specifically for innovation partners
4.3	Rank potential partners according to their suitability to the project

Figure 4-1: Requirements for a OI-partner-search approach

## 4.1 General requirements from OI characteristics

The requirements here gathered ensure a correct approach of OI. Gürtler and Lindemann (2013, p. 5) identify two dimensions to determine the relevance of potential partners: their innovative capacities for the project, and their influence on the success of the project. Therefore, an OI-partner-search method should combine the partner's analysis from both technical and strategic perspectives to ensure their ability to cooperate. The requirements from the source in this category were originally six. They have been simplified and reduced to two, being limited to the basic requirements from OI. This will ease their direct understanding and assessment.

**(1.1) Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities.** The approach takes into account the technical abilities gained when selecting partners through this approach. An OI-project requires from the OI-actors the technical potential to solve a technical task (Piller & Ihl 2009, p. 36) (Gürtler 2015, p. 2). Here, two of the requirements from Gürtler et al. (2013) have been brought together. It differentiated between gaining people who can give information on customer and market needs, and gaining people who can give information about solution possibilities. It has been considered that both types information potentially contribute to a solution. Therefore, they are proposed as one only requirement.

**(1.2) Provide an overview of the strategic relevance of the potential partners.** The approach assesses the strategic skills of partners that are being considered. It analyses the influence the partner may have on the success of the OI-project or other OI-actors (Gürtler 2015, p.2). This requirement wasn't included in Gürtler et al. (2013) but has been considered that the analysis of the potential strategic gain is also important.

## 4.2 Requirements for reducing risks

Opening the innovation process to external input can involve some risks to the company. The risks identified by Enkel et al. (2005), focused on customer integration, are:

- Loss of knowhow
- Dependence on customer's views
- Dependence on customer's demands and personality
- Limitation to mere incremental innovations
- Serving a niche market
- Misunderstandings between customers and employees

Companies see these risks as concerns against Open Innovation. Reducing them could encourage more companies to implement OI. Therefore, a partner search-approach should help the company prevent these risks. The requirements here gathered try to avoid some of them, expecting the approach to protect the company from such risks when implementing it. In Gürtler et al. (2013) they are represented by seven requirements: six regarding the risks

here mentioned and one more requirement to avoid internal barriers such as the “not-invented-here”- syndrome. In this research, the risks mentioned above have been transformed into five requirements regarding these risks.

**(2.1) Analyse the motivation and/or interests of potential partners in cooperating:**

The approach should take into account the motivation and interest of potential partners in participating when selecting potential partners. Enkel et al. (2005, p. 205) suggests that this measure helps to reduce the loss of knowhow through disloyal partners. A careful selection of the partner is important to only integrate trustworthy actors into the company. Harhoff et al (2003) give an insight about the possible motives for an external actor to cooperate: product use and improvements; network effects and standards, and reputation. Also incentives to motivate actors to transfer their knowledge or ideas should be here investigated (Piller & Ihl 2009, p. 20).

**(2.2) Not require the publication of internal information, to prevent knowledge drain:**

Let as less information out as possible: the approach does not let out more internal information than the necessary. It is another measure to minimize any loss of knowhow.

**(2.3) Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only:**

The approach prevents the firm to be blind to different influences/ contributions and close themselves to the customer’s point of view or opinions. Here two of the risks stated above are brought together: the risk of dependence on customer’s views and the risk of dependence on customer’s personality and demands. By considering other types of partners, these risks can be avoided. This requirement can also avoid serving to niche markets, by involving partners from different origins (Enkel et al. 2005, p. 209).

**(2.4) Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable:**

This requirement has not been directly extracted from literature. But the risks of dependence on customer’s views, personality and demands can be analogously applied to other kind of partners. Therefore, the approach should perform an open search where the type of partner pursued is not pre-defined to avoid such risks.

**(2.5) Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation:**

The identified partners should not only have the capability to come up with a solution of a (technical) problem for an existing problem/ situation, but also are able to look beyond that, perceive the upcoming necessities of the market and create completely new solutions. These could be for example Lead-Users, who are intrinsically motivated to give innovative solutions (Gürtler et al. 2013, p.8). Also the stakeholders who have ever patented any technology are expected to be capable

of producing ‘something’ new. Other potential actors, may also be capable of it, but by the approach this cannot be proven (e. g. we do not know if suppliers/ the chosen supplier will offer new ideas or only will help improve the product) (Enkel et al. 2005, p. 208).

### **4.3 Requirements with regard to the company**

The requirements with regard to the company were “requirements for engaged companies” in (Gürtler et al. 2013). They were requirements that the company implementing OI should fulfil. They have been here adapted as how the search approach encourages/supports the company to have those characteristics.

#### **(3.1) Allow and support the company to have a disclosure competence:**

‘To disclose’ means “to make something known publicly or to show something that was hidden” (*Cambridge online dictionary*). That means, with regard to a company, that it should have the readiness and willingness to share with an external party some internal information. It is essential in OI to share a minimum of internal data. However, firms can hesitate to do so because of secrecy concerns and the “Not-Invented-Here”- syndrome (Piller & Ihl 2009, p. 39). Firms have to decide the amount of information revealed, as well as carefully select to whom they reveal it. But in any case the firm should have a disclosure competence. Piller & Ihl (2009, p. 40) remarks the importance of the correct use of the search methods tools.

#### **(3.2) Allow and support the company to have an absorptive competence:**

Piller & Ihl (2009, p. 42) define the absorptive competence (called appropriation competence) as the ability to capture the co-produced knowledge and protect it against outsiders. The approach should encourage the company to absorb new technologies and knowledge as their own. That also involves avoiding the “Not-Invented-Here”- syndrome (Katz & Allen 1982) (Gassmann & Enkel 2004, p. 13).

#### **(3.3) Allow and support the company to have an integration competence:**

The integration competence refers to the ability of the company to use the gained knowledge in their NPD process. This involves integrating different inputs from different partners into a single solution, and the utilization of this solution into the company’s processes (Piller & Ihl 2009, p. 44). A search approach should encourage the company to

#### **(3.4) Allow and support the company to have the competence to maintain control over a project:**

External input can be lost in the company before its actual utilization. This can be caused by reluctance from internal R&D departments to external input, by the loss of information during its transfer or by the inability of partners to express their needs or ideas. According to Enkel et al. (2005, p. 210), these misunderstandings can be minimized by involving already-known partners and ensuring their long-term commitment to the project. A partner search approach should therefore take into

account these traits when searching for a partner to ensure the help the company maintain control over the duration of the project.

**(3.5) Allow and support the company to identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners:**

Gatekeepers is understood as the personnel from the company (individual or group) who is in charge of maintaining proper communication with the (potential) internal or external partners and exchanging the necessary information. Supporting communication between external partners and the firm has a positive effect on technological innovativeness and budget (Gemünden et al. 2007, p. 419). Also, enforcing communication between partners and the firm can avoid misunderstandings that can lead to the loss of the information gained (Enkel et al. 2005, p. 2010). Therefore, it is expected from partner-search approaches to encourage the identification of a team who ensures the proper communication and organizational information exchange between the firm and the partners. In the context of OI, this refers to the OI-team of the company.

#### **4.4 Requirements for approach efficiency**

Finally, the requirements for approach efficiency have been specially added in this thesis to keep in mind the approach implementation. They overlook how efficient the approach is in terms of conduction and results. The goal of the search approaches is to find suitable innovation partners. Hence, these requirements regard the focus of the approach in innovation partners, and the level of abstraction of the process and the results.

**(4.1) Contain a detailed step-by-step process description:**

It regards the level of detail of the method description. This requirement ensures that the approach presents a clear structure to follow, so the firm knows how to perform the search-method.

**(4.2) Look specifically for innovation partners:**

This requirement was added while the research was conducted. Many of the found approaches were not specifically focused on Open Innovation. Otherwise, some of them provide with a partner selection method for other types of partners. Therefore, the focus of the approach on innovation partners is not presumed, but desired.

**(4.3) Rank potential partners according to their suitability to the project:**

This requirement has been added by the systematic observation of the found approaches. Not all of them provide a ranking of the potential partners as a result; some of them deliver a more abstract evaluation. Therefore, this requirement expects from the approach that its output or results is/are already the most suitable partner among the analyzed potential partners. It is desired from a partner search approach to provide with a ranking system, such as an overall score regarding the suitability of the potential partners for the project. Then, by implementing this approach, firms can

already specifically identify the best (one or more) potential partners.



## **5 Partner Search Approaches**

This research aims to seek and assess methods that support a company in the process of finding, selecting and assessing potential Open Innovation partners. This section presents the search for partner search approaches: it takes a look in the existing literature about partner selection methods. The first part in this section will present the methodology that has been used to systematically look for these methods. It will help not to miss any type of stakeholder that could be valuable as an OI-partner. To that end, a supporting tool has been used: a ‘partner structuring’ table. This table tries to enclose all possible stakeholders with whom a company could collaborate. With it, the search terms have been derived to perform the search.

To characterize the identified approaches, a specific profile will be used. This profile is explained in detail in the following sub-section. The main idea and procedure of each approach will be depicted in it. Afterwards, the 39 identified approaches will be presented, with a brief explanation supported by their fulfilled profile.

### **5.1 Research methodology**

Open Innovation needs for a methodical approach to look for partners. So far, no pool or database of partner search approaches has been found in the literature. However, a large variety of partner search approaches can be found for different disciplines. But there is no consistent term across these different fields for the ‘partners’ or a ‘partner search’. Therefore, a systematic search is needed to identify these approaches, and avoid missing relevant ones. This way, a holistic search can be performed to find different types of partner search approaches.

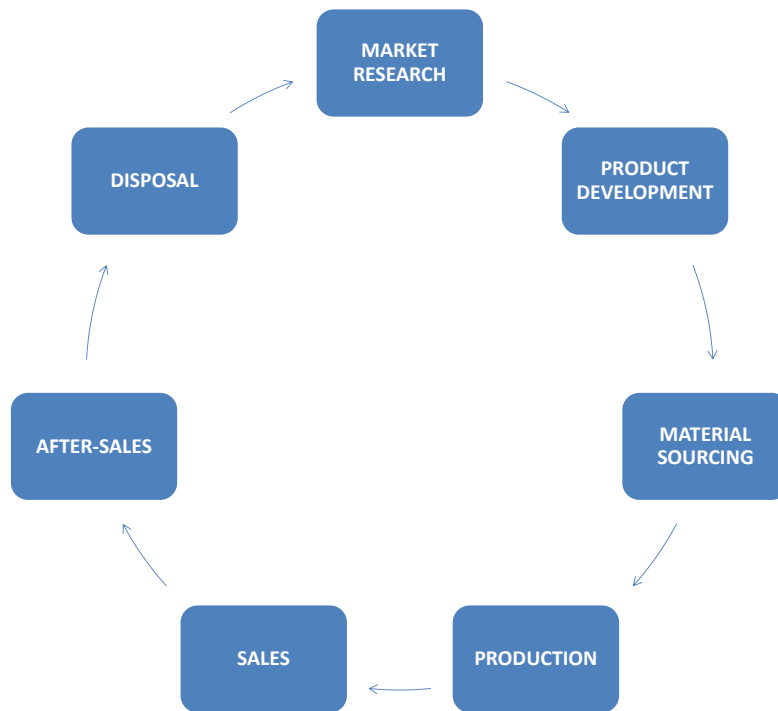


Figure 5-1: Innovation process (based on the Handbook of Systems Engineering)

To that end, a company's potential partners have to be taken into account. These potential partners have been structured according to the **innovation process**, shown in Figure 5-1 (Handbook of Systems Engineering). For each phase in the process, the most typical stakeholders have been included by systematic consideration. This table enclosing different potential partners will be used as a tool. With it, search approaches for different potential partners will be researched.

The different stakeholders suggested for each phase of the process can be seen in Figure 5-2. This tool is helpful to define the search fields for partner search approaches. Furthermore, it is useful to keep record of the fields that have been already investigated by this research, and those that are still open for future research.

MARKET RESEARCH	<ul style="list-style-type: none"> <li>• Knowledge sources (universities/ research institutes)</li> <li>• Investors</li> <li>• Competitors</li> <li>• Firms within the same field</li> <li>• Venture firms</li> <li>• Supervisors</li> </ul>
PRODUCT DEVELOPMENT	<ul style="list-style-type: none"> <li>• Consultancies</li> <li>• Technical engineers</li> <li>• Government Patents/ Licenses</li> </ul>
MATERIAL SOURCING	<ul style="list-style-type: none"> <li>• Material or Product Suppliers</li> <li>• Service providers</li> </ul>
PRODUCTION	<ul style="list-style-type: none"> <li>• Operators/ employees</li> <li>• Temporary employees</li> </ul>
SALES	<ul style="list-style-type: none"> <li>• Sales planner</li> <li>• Logistic planner</li> <li>• Marketing agencies</li> <li>• Retailer</li> <li>• Buyer</li> </ul>
AFTER-SALES	<ul style="list-style-type: none"> <li>• Maintenance department</li> <li>• After-sales service providers</li> <li>• Replacements/ Reparatons departments</li> <li>• User</li> </ul>
DISPOSAL	<ul style="list-style-type: none"> <li>• Special handling service providers</li> </ul>

Figure 5-2: Potential partners for each phase in the innovation process

Using this tool, a systematic search has been performed by deriving search terms from the proposed stakeholders. The search terms used, related to each phase of the process, can be found in Appendix 1. These terms have been introduced in different search engine (e.g. *Google Scholar*, *Web of Knowledge*, *Scopus*, etc.) to find different search approaches.

For the found approaches, a methodical way for their characterization has been used. It consists in a profile table that intends to enclose all the significant information about the approach. Also, it will make easier the comparison between approaches, and further on, the selection of the most suitable approach for using it in an OI-project.

## 5.2 Approach profile

To describe the partner search approaches in detail, an **approach profile** has been used. This tool will be also helpful in order to compare and select search approaches for an OI-project. In this research, the profile originally proposed by Saucken (2015), adapted by Grtler (2015), has been modified and used to fit the goal of the thesis.

The profile, shown in Figure 5-3, consists in a table with different fields. All of the fields are followed by an explicative question that clarifies the meaning of the element to be described (which are not shown in Figure 5-3 due to space constraints). As can be seen in Figure 5-3, the fields are differentiated in four clusters, distinguished by colours: **Method description**, **Goal**, **Preconditions** and **Effort**. The ‘Method description’ requires the input of a written description, while the lower part offers different options to highlight the most

suitable one for each approach. This can be the primary basis for the selection of suitable approaches (Gürtler 2015, p. 4).

<b>Method description</b>	<b>Goal</b>	<textual description>					
	<b>Partner type</b>	<textual description>					
	<b>Input</b>	<textual description>					
	<b>Output</b>	<textual description>					
	<b>Requirements</b>	<textual description>					
	<b>Limitations</b>	<textual description>					
	<b>Advantages</b>	<textual description>					
	<b>Disadvantages</b>	<textual description>					
	<b>Procedure</b>	<textual description>					
	<b>Other methods</b>	<textual description>					
	<b>Relevant sources</b>	<textual description>					
	<b>Examples</b>	<textual description>					
<b>Goal</b>	<b>Process phase</b>	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	quality	quantity				N/A
	<b>Degree of newness</b>	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	none	useful	necessary			N/A
	<b>Type of method</b>	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	overview of topic	user needs	solutions			N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	rough topic	precise terms	definition of task			N/A
<b>Effort</b>	<b>Effort investment</b>	low	high				N/A
	<b>Re-usability</b>	no	yes, adapted	yes, directly			N/A

Figure 5-3: Profile template for a partner search approach

In general, most of the fields can be fulfilled with information provided by the specific source. However, if the source does not provide with explicit or enough information, the field will be fulfilled if a description can be derived from it, and marked as (\*). An extended example is the field of ‘Disadvantages’: most of the sources do not point out the own drawbacks of the approach they proposed, but maybe a disadvantage can be seen from the point of view of the firm, or by comparison with other approaches.

An extended example is the field of ‘Disadvantages’: most of the sources do not point out the own drawbacks of the approach they proposed, but maybe a disadvantage can be seen from the point of view of the firm, or by comparison with other approaches. Otherwise, the field will be marked as N/A- Not Applicable.

A more detailed description of each of the four categories can be found in the following sub-sections:

### 5.2.1 Method description

The first group of elements is the ‘Method description’. In general, it gives a rough description of the approach. The fields here describe are:

- **Goal: What is the specific goal of this method?** Short description of the main goal of the approach; it states what this method specifically looks for.
- **Partner type: What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?** Type of partner that the method looks for or analyses. It can be a technical/strategic partner, but also a specific type e.g. customer. This field was not in the original profile (from Gürtler 2015). However this information about the approach has been considered as relevant since the search methodology is based on the possible types of partner.
- **Input: What input (data, information) is needed to apply this method?** All the information that is needed through the performance of the approach. If the approach needs a group of potential partners to rank or evaluate them, this group of potential partners is also an input.
- **Output: What output (data information) does this method deliver?** Description of what will the firm obtain by applying this approach, for instance: a ranking of potential partners regarding their suitability or other criteria, an overall score for each studied potential partner, an evaluation of the input potential partners, the identification of the most suitable type of partner, etc.
- **Requirements: Is there any e.g. special data required to conduct the method?** Anything the method requires from the firm, such as access to specific data or a group of potential partners (the group of potential partners is a requirement if the method cannot be performed without it). This field has not been extracted from the original profile (Gürtler 2015). However, a firm has to meet the requirements from the approach in order to use it. Therefore, it has been included as a useful field to support the selection of a suitable approach for a company.
- **Limitations: What limitations is the approach subject to?** Limits of application or significance of the approach (if it has such). In other words, if the approach can only be implemented in a specific field or situation for some reason. This field was also not included in Gürtler (2015). It has been added because it can be useful to analyse if the approach fits with the company’s OI-situation.
- **Advantages: What are the specific advantages of this method?** Benefits that the method will provide to the company by its conduction.
- **Disadvantages: What are the specific disadvantages of this method?** Drawbacks that can derive from performing this approach.

- **Procedure: What are the steps to conduct to perform this method?** Description of the specific steps of the method. If the approach is more of an abstract guide, an overview of the procedure will be here explained.
- **Other methods: Are there any sub-methods used?** Any methods or procedures that the approach uses through its conduction as a sub-step, e.g. questionnaires or specific algorithms. This field is not included in the profile presented by Gürtler (2015). However, many of the approaches found use different methods. These sub-methods can be helpful in order to compare different search approaches with one another, and to evaluate if the sub-methods can be useful for a future search.
- **Relevant sources: Which are relevant literature sources to gain background knowledge of this method?** Citation of the paper or publication where the method has been found.
- **Examples: What are exemplary applications of the method?** Exemplary case of the implementation of this method, if it exists.

### 5.2.2 Goal

This category encloses the fields regarding the main objective of the approach. It analyses how the approach is performed: when to implement it, how does it identify potential OI-actors, how is the output and if there are any other results.

The elements on this group require no longer a textual description, but to select the most suitable options (or more than one) among the proposed alternatives. If none of them are suitable enough, or the element to be evaluated does not fit the approach being described, a N/A (Not Applicable) option is available for all the elements. The fields here gathered are:

- **Process phase: In which phase is the approach to be implemented?** The options are the six sub-steps of the SOI partner search (phases of the step 2 in the *SOI* model: *Selection of OI-actors*). It identifies the SOI sub-phases in which the approach can be implemented depending on its characteristics. This field was not included in the profile presented by Gürtler (2015). However, the goal of the research is the enhancement of the available partner search approaches for implementing the *SOI* model. Hence, it makes sense to take into account the step in which each approach can be implemented.
- **Result focus: Does the method focus on a large number of results or a lower number with higher quality?** This element differentiates whether the approach attempts to obtain a specially identified partner/s ('qualitative') or it just defines a search direction or a whole group of partners where to continue searching ('quantitative'). If the results are a group of partners but the possibility of ranking them is available, that will be considered as a 'qualitative' result, because the most suitable one can be identified.
- **Degree of newness: How new or unknown are the identified actors to the company?** The identified actors are 'well known' to the company if it has already worked with them (not necessarily as OI-actors, but in any kind of partnership or cooperation, e.g. suppliers). They are 'vaguely known' if the company knew about them but had no previous cooperation with them. Finally, the identified partners are

considered ‘completely unknown’ if the firm was not aware of them before the search for a new partner. The approaches that require a pool of potential partners will match the ‘vaguely known’ option. This pool has to be formed by partners that the company has somehow previously selected.

- **Degree of interaction: Does the method require an interaction with external actors?** Differentiates between three options: ‘none’, if there is no contact at all during the conduction of the approach; ‘necessary’, if the approach requires interaction with the potential partners; and ‘useful’, if the approach does not require interaction but contact with the potential partners can somehow be helpful (by providing a better output, or making the performance of the approach easier).
- **Type of method: What is the type of the method?** Three types of method have been here categorised regarding the scope of the search. An ‘open search’ is a search approach where the pool of partners within which to choose is not limited to a group of pre-selected partners. An example is a search where the potential partners are not defined, like a broadcast search: the partners being approached are unknown and unspecified. Otherwise, it is a ‘search within a pool’ if a group of candidates is already available. Finally, it is just an ‘assessment’ method if the approach provides with guidelines to evaluate potential partners by specific means.
- **Identification of potential OI-actors: Who does the potential OI-actors identify?** It states who is responsible for the identification of the potential partners in this approach. It will be the ‘OI-team’ if they have to actively perform the search. It will be ‘self-selection’ if the potential actors have to somehow approach the company to be identified (e.g. responding to a technology request). Otherwise, ‘other actors’ are responsible of the identification of the potential OI-actors if they are pointed out as valuable for some reason by some others, e.g. peers in a community.
- **Level of abstraction: How specific is the method description?** To describe how specific and well described are the steps of this approach. The original model had three options: ‘general overview’, ‘abstract guide’ and ‘methodical guide’. Two additional options are added: ‘descriptive’, if the approach is rather an explanation of a real case of partner search, and ‘implementation case’, if the approach includes the application of the method into industry.
- **Additional results: What are potential additional results besides OI-actors?** It points out three possible outputs that the company can gain (apart from the identification of potential partners): ‘overview of the topic’ (general knowledge about the issue being held, or about the partner selection); ‘user needs’ (requirements from the users); and ‘solutions’ (by applying this approach the company can also obtain solving of a specific task).

### 5.2.3 Preconditions

The third group regards the Preconditions the approach requires to be implemented. The elements in this category roughly define the starting point of the search approach: if previously known actors are needed (already known OI-actors), if pre-existing infrastructures are essential, and the search direction’s level of detail that the approach requires from the company.

- **Existing infrastructure/tools: Does this method require specific infrastructure?** The approach could require a pre-existing infrastructure; this will also be listed in the 'Requirements' field in the first category ('Method description'). Adding it here also makes sense as it states the pre-conditions required by the search approach to be performed. Also, the requirements of the approach can be easily learned. Here it has three options: 'none' [no pre-existing infrastructures required], so directly the approaches with none of the proposed requirements can be filtered when performing a search within the approaches; 'community', if an already conformed community is needed to apply the approach on them; and 'web-platform' if it the approach has to be implemented through one.
- **Already known OI-actors: Does the method require already known actors as a starting point?** If the identified actors are found through already known actors (single one or a group of them); or if no previous actors are needed.
- **Concretisation of search direction: How precise does the search direction need to be defined?** The approach can require a specific task for which a partner is needed ('definition of a task') or only the field in which the company looks for an expert/partner ('rough topic'). Otherwise, the approach maybe needs for precise search terms to be performed (e.g. to be introduced as a query for a search software).

#### 5.2.4 Effort

Finally, the fourth group aims to point out the effort required to conduct the approach. The original approach profile had five fields in this category ('Learning the method', 'Preparation', 'Re-usability', 'Conduction', 'Operationalization'), which have been condensed in just two. This is due to the difficulty of evaluating the effort investment and differentiating it by its cause (for instance, differentiating the effort in the preparation from the conduction of the method). Therefore, the profile used in this thesis has only two fields that are strongly related: 'Effort investment' stands for the effort investment the approach requires on the whole. That is, the effort in the learning of the method, preparing it and conducting it. Then, 'Re-usability' can be seen as evaluating the worth of this effort, meaning if the effort invested produces an output that can be used again.

- **Effort investment: How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?** As a general guide, a 'high' investment of effort will be stated when the approach has a methodical guide with several steps, involving specific software, criteria weighting, mathematical models to be run or high personal effort. A 'low' investment of effort will be assigned to those approaches that do not require an extensive amount of resources, mostly those that are more flexible approaches with not so restrictive guidelines (abstract guides).
- **Re-usability: Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?** If the approach has some sub-methods that are likely to be used in some other search approaches, it is re-usable. If the criteria or requirements are created or weighted through the approach, it is re-usable but with the need of adaptation. If everything built through the approach is so



specific that will be of no use after the search is conducted, then it is not re-usable.

### 5.3 Identified search approaches

This section introduces the results of the conducted research. A total of **39 partner search approaches** have been found. First, they are presented according to the product life cycle used to their search. The number of approaches found for each phase of the cycle can be seen in Figure 5-4. Four of them have been considered as generic approaches for partner search, in the sense that they perform a search open to any partner. Therefore, they are not included in this categorization.

MARKET RESEARCH	10
PRODUCT DEVELOPMENT	10
MATERIAL SOURCING	5
PRODUCTION	4
SALES	2
AFTER-SALES	4
DISPOSAL	0

Figure 5-4: Number of approaches identified for each phase of the product life cycle

It is clear in Figure 5-4 that more search approaches have been found for the stakeholders in the early phases of the cycle, while the last phases have the least search approaches. Specifically, the phases of **Market research** and **Product development** have the largest number of search approaches. One of the reasons is that these phases offered a high variety of stakeholders, e.g. universities and research institutes, but also other firms in the market and experts in a field. Also, alliances are not rare between these types of stakeholder (such as strategic alliances between firms, virtual organizations, co-development alliances, etc.). Therefore, partner search and selection approaches were relatively easier to find than for other phases of the product life cycle. This is, regarding to the effort invested in deriving the search terms that led to significant findings. However, no approaches have been found so far regarding strategic relevant OI-partners e.g. supervisors within the same field. That does not mean that there are none, but that more research is needed.

With regard to the other phases of the cycle, the approaches found for the **Material sourcing** phase are search approaches for material and service providers. In the fourth phase, **Production**, all the search approaches are regarding employees of the firm. Finally, in both **Sales** and **After-sales** phases, the approaches found aim to select the most suitable customer or user (respectively) with whom to collaborate. Furthermore, also some approaches focused on distribution and logistics have been found for the **Sales** phase.

As can be seen in Figure 5-4, no approaches have been found so far for the **Disposal** phase.

Therefore, this is also a field that requires more research.

In Figure 5-5 can be found the list of the found approaches for each phase of the cycle. Each of them has been named with a short descriptive title, as well as with the citation of the source where it has been found.

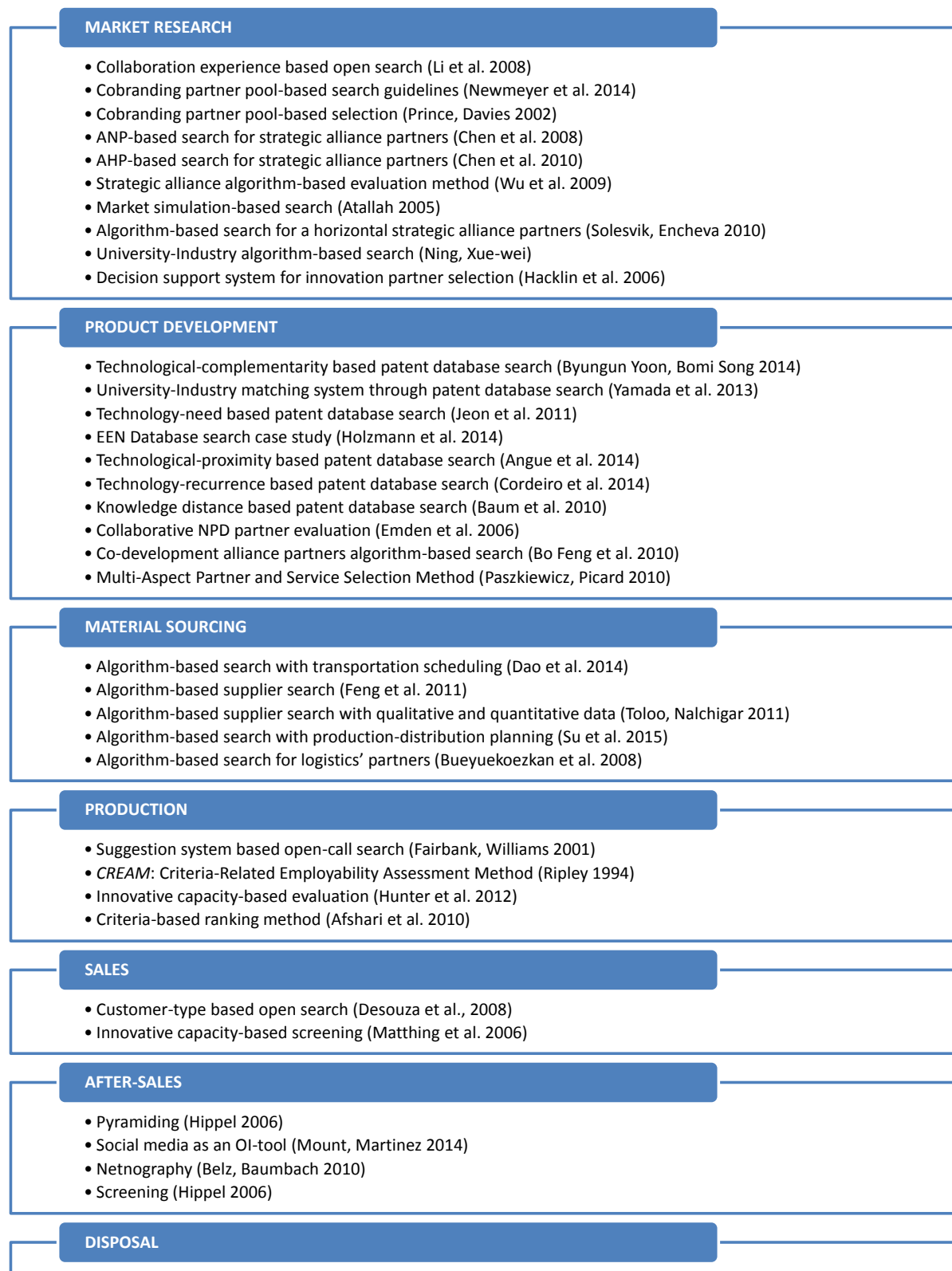


Figure 5-5: Identified approaches according to the partner structuring table

Moreover, there have been identified recurrent types of search among the found search

approaches. More specifically, six different types of partner search are used regardless of the type of partner sought. For that reason, all the found approaches have been clustered in six categories, listed in Figure 5-6, according to this type of search. Figure 5-6 also shows the number of approaches classified into each cluster.

OPEN SEARCH	3
NETWORK-BASED SEARCH	1
OPEN CALL SEARCH	4
DATABASE SEARCH	7
POOL-BASED SEARCH	9
ALGORITHM-BASED SEARCH	15

Figure 5-6: Number of approaches identified for each type of search

As can be seen in Figure 5-6, the **algorithm-based searches** are the most common among the results of this research. Figure 5-7 shows a list of the identified approaches classified into each type of search. A characterization of each type of search will be given in the next sub-sections. After the explanation of the common characteristics of each cluster, a brief description of each search approach can be found, together with the lower part of the approach profile for that specific approach. In the Appendix 2 can be found the whole profiles for all the approaches.

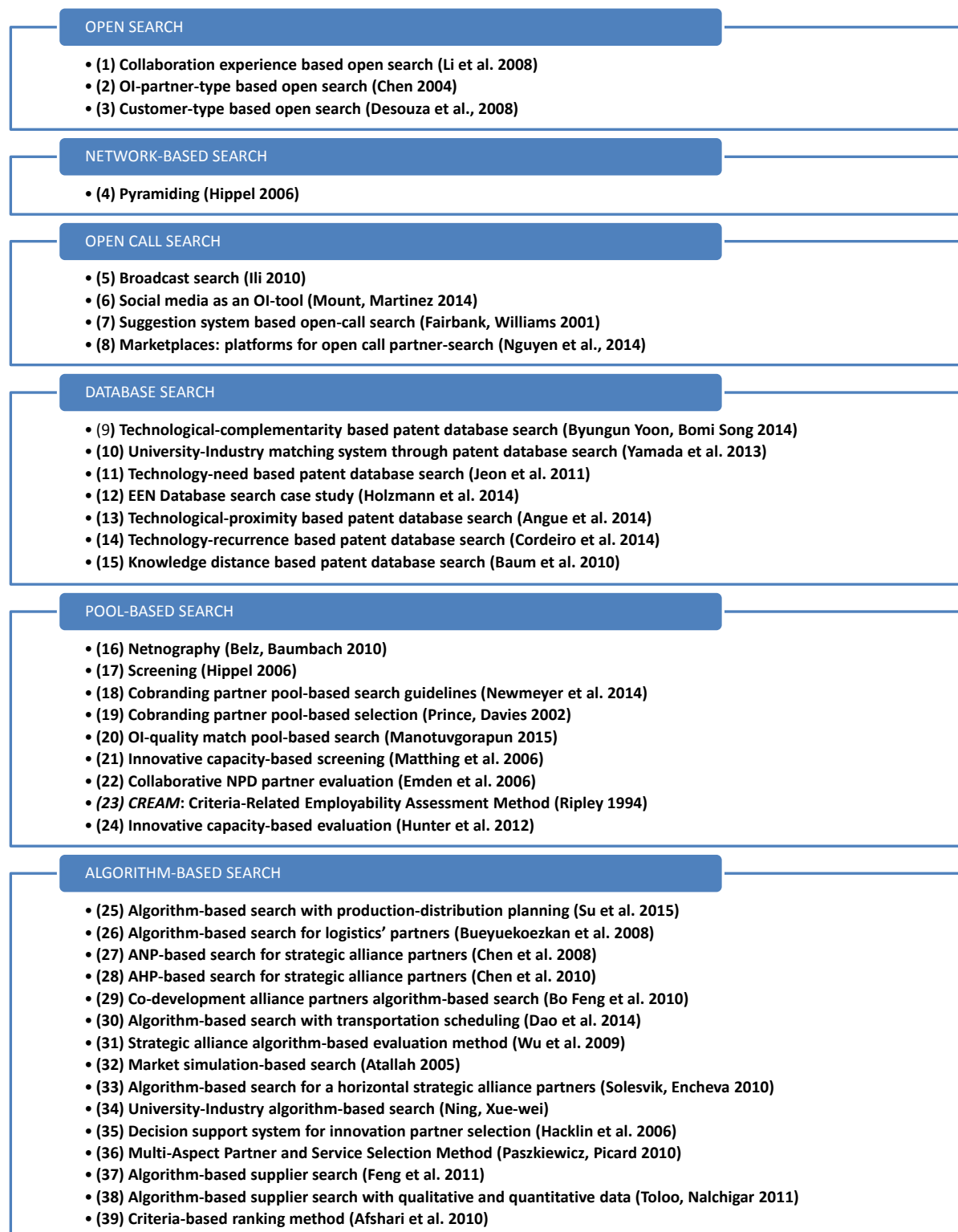


Figure 5-7: Identified approaches according to the type of search

### 5.3.1 Open Search

This cluster encloses all the approaches that can be categorized as **open searches**. They are named ‘open searches’ because they are not focused on a defined pool of potential partners. That means they do not look for partners among a specific group of potential partners. Instead, they provide with an overview and analysis of all the possible partners (or possible partners within a specific type) for a company. Their goal is to identify the most suitable partner/ type of partner regarding the company’s OI-situation and project. In other words, taking into account its characteristics, culture, the project being handled, the alliance it looks for, previous experience with OI, etc.

Normally, the output obtained when applying one of these approaches will not be an individual partner with whom to collaborate. Instead, the most suitable type of partner for the company regarding the specific OI project can be identified. Therefore, the result focus will normally be in ‘quantity’ more than in ‘quality’, according to the definition of these terms made in the explanation of the approach profile. This implies that another search approach will be needed to identify the individual prospective partner among the group proposed by the open search.

For the implementation of this type of search there are normally no pre-requirements. However, it is usually useful an analysis of the OI-situation of the company, as well as the search direction.

Three partner search approaches have been classified as open searches. They are:

#### **(1) Collaboration experience based open search (Li et al. 2008)**

This approach offers guidance to determine with what kind of partner a firm should collaborate. It evaluates the suitability of potential partners based on previous experience in collaborating with them. Li et al. (2008) classifies the possible partners in three categories:

- Friends: The company has already worked with them for a long period (so they are well known to the firm)
- Acquaintances: The company is aware of them but their relationship is weaker. They have had no or very limited previous partnerships
- Strangers: Completely new partners. The company has no previous knowledge of them.

The approach provides a set of statements associating the three groups of partners to the firm’s situation and innovative needs. This way, a firm identifies which one of the categories best fits their project. Then, the firm can scan through the group that best suits its circumstances. It is not a conclusive approach, but a helpful one to help orienting the search. Accordingly, Figure 5-8 shows that the result of the approach is focused on ‘quantity’.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-8: Approach (1) Collaboration experience based open search (Li et al. 2008)

The limitation of this approach is that the difference between *Friends* and *Acquaintances* is very diffuse. The definition of each one will be defined when implementing the approach (for instance by establishing a minimum number of interactions with another firm for it to become a *Friend*), as no strict definition of each is given.

**(2) OI-partner-type based open search (Chen 2014)**

The approach proposed by Chen (2014) is similar to the approach (1) Collaboration experience based open search (Li et al. 2008), but is specific for Open Innovation partners. It analyses the internal capabilities and performance of the firm, and it suggests what type of partner would fit best. The types of partner proposed are four:

- stakeholders on product value chain
- competitors and firms in other industries
- universities and other research institutes
- intellectual property organizations and other technology agencies

Again no specific partner is targeted, but a whole group. With this output the firm can keep looking for a suitable partner within the resulting type of partner. This is why the result focuses on ‘quantity’, as Figure 5-9 shows.

This procedure also proposes ways of collaboration with each group of partners. With it, it tries to ensure a more efficient OI implementation. That is why this approach is also helpful in the phase of ‘Developing cooperation strategies’, as can be seen in Figure 5-9.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-9: Approach (2) OI-partner-type based open search (Chen 2014)

### (3) Customer-type based open search (Desouza et al. 2008)

This approach focuses on customers as innovation drivers. It helps categorize customers into three groups:

- ‘technology optimists’
- ‘technology investors’
- ‘technology constrained’

With that, the firm can, on the one hand, target its market, and on the other hand, approach the customers that are more suitable to be OI-actors.

The main requirement for this approach is deciding that the firm’s potential partners will be customers. Also access to the information about a community or group of them is needed. An advantage of this approach is that customer involvement in gathering information is minimal, since most of it is readily available. This is why Figure 5-10 indicates that interaction with potential partners is useful but not necessary. This minimizes the effort investment, as well as reduces the information leakage. However, specific methods to analyze the high amounts of customer data would be helpful.

Overall, this categorization of customers may be useful for a future search. The sub-methods used to analyze data can also be further used for other searches, so it has been considered that the invested preparations and outcomes can be directly re-used.



Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-10: Approach (3) Customer-type based open search (Desouza et al. 2008)

### 5.3.2 Network-based search

This second category encloses those approaches that base the search on an existing network of individuals or organizations (a networks formed by a group of any type of partner). Generally, the goal is to identify the most innovative and experienced individual/s in the network; or the one with the characteristics desired by the company. Therefore, this type of search requires a pool of potential partners within which the search will be implemented.

The search is based on using the connections between the members of this network to obtain information about themselves and their peers. Hence, normally the selected potential partners will be identified by other stakeholders.

In addition to targeting potential partners, information about the stakeholders' point of view (opinions, market needs...) can be gained through this kind of approach, both through direct or indirect approach. However, direct interaction is not mandatory to conduct this kind of search. A network-based search can be based exclusively in the observation of the members' behaviors in the network and their inner interactions. This way, information about them can also be extracted, and those with higher innovative potential identified.

As for requirements, it is necessary the existence of said network of people or organizations. However, the type of partner in the network, and the kind of network is irrelevant.

So far, only one approach is presented, but this search type is open for further findings.

#### (4) Pyramiding (Hippel 2006)

This search approach is centered on a network of users.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-11: Approach (4) Pyramiding (Hippel 2006)

### 5.3.3 Open-call Search

This category encloses all those approaches whose principle of work is a **passive search**. This means that the potential partners are not directly selected and approached by the company. Instead, the company publishes a request (e.g. for a specific task), and waits for interested potential partners to respond. Therefore, these potential partners will select themselves via **self-selection**. A generic advantage of this type of approach is that only the interested potential partners (individual solvers, companies, etc.) respond to the request. In other words, it ensures the motivation of the identified group of potential partners. Those who have no interest in collaborating will directly not reply to the request.

In order to publish the request, a suitable platform is required. By these means, both individuals and organizations can be reached. This type of search is not addressed to a specific kind of partner. The specific platform where the request is published will determine the 'public' that is being addressed.

Accordingly, the output of this search is directly a set of prospective partners who have selected themselves. But these candidates have to be further evaluated. Therefore, a screening will normally be needed after an open call search. When enough applicants have answered to the request, they will be assessed by the focal firm as prospective partners. This way the firm can decide which one of them is the most suitable for the OI-project.

In general, the starting point for implementing this type of search is to identify the task or skills for which a partner is desired. Also, the platform where the desired potential partners can be reached through the request has to be determined.

So far, this research has found four approaches of these characteristics:

**(5) Broadcast Search (Ili 2010)**

This approach presented by (Ili 2010) explains how to get potential partners by letting them reach out to the firm. Through publishing a request in a specific web-platform, solvers with the desired characteristics can contact the firm and proposing their solutions. Thus, this search requires access to a web-platform, and the reviewed skills will be the ones stated in the request. Therefore, a posterior evaluation of the potential partners that have appeared is necessary.

This approach can be implemented in any stage of the search, meaning that has no previous requirements.

<b>Goal</b>	<b>Process phase</b>	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	<b>Result focus</b>	quality	quantity				N/A		
	<b>Degree of newness</b>	well known	vaguely known	completely unknown				N/A	
	<b>Degree of interaction</b>	none	useful	necessary				N/A	
	<b>Type of method</b>	open search	search within a pool of potential partners		assessment			N/A	
	<b>Identification of potential OI-actors</b>	OI-project team	other actors	self-selection				N/A	
	<b>Level of abstraction</b>	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	<b>Additional results</b>	overview of topic	user needs	solutions				N/A	
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	none	community	web-platform				N/A	
	<b>Already known OI-actors</b>	none	single OI-actors	groups of OI-actors				N/A	
	<b>Concretisation of search direction</b>	rough topic	precise terms	definition of task				N/A	
<b>Effort</b>	<b>Preparation</b>	low	high				N/A		
	<b>Re-usability</b>	no	yes, adapted	yes, directly				N/A	

Figure 5-12: Approach (5) Broadcast search (Ili 2010)

**(6) Social media as an OI-tool (Mount & Martinez 2014)**

This approach proposes to use online social media as a platform to find new potential partners. Its profile is shown on Figure 5-13. Mount & Martinez (2014) defend that social media can be helpful in the three stages of innovation: ideation, R&D and commercialization. Many specific methods to implement this approach are suggested in (Mount & Martinez 2014) through multiple case studies. Social media can help identify the most ‘useful’ users (those with more innovative abilities).

Many advantages are related to this approach. First of all, involving the customer in the innovation process can create emotional bonds with the company, which promotes the customer’s satisfaction and loyalty. In terms of innovation, it enables both radical and incremental innovation, depending on the identified customers. Finally, it does not require high economic investment, and it is highly effective. A reason for it is that the users normally evaluate each other’s ideas, recognizing those with more innovative potential. This way, they make the ‘Lead-Users’ of the community to naturally outstand. This could also be a characteristic of a Network-based Search, as it uses the relationships/interactions between the members of the community.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-13: Approach (6) Social media as an OI-tool (Mount & Martinez 2014)

However, it also has some disadvantages. Basically, the processing of all the generated new ideas and proposals can be a problem in terms of quantity. This normally requires too much time and effort. It can happen due to the openness to public of the social media sites: useless contributions cannot be avoided.

**(7) Suggestion system based open call search (Fairbank & Williams 2001)**

This search approach focuses on the employees of the focal firm as potential innovation partners (Fairbank & Williams 2001). To this end, it proposes to implement a ‘suggestion system technology’, based on the expectancy theory (enhancing expectancy, instrumentality and valence), where employees can submit their ideas. Thus, a common platform between the employees and the OI-team is necessary to implement it. Given this, suggestion systems can be implemented in any organization, even though their efficiency will depend on the number of employees the firm has.

The results of this approach are clear: the firm will identify the employees capable of producing innovative ideas (both radical and incremental, depending on the proposal stated in the suggestion system). Furthermore, the company can gain ideas/ solutions from individuals who would otherwise not be involved in the innovation process, meaning that those ideas would not be used.

Figure 5-14 shows the profile for this approach. It has been considered as a search within a pool of partners due to the fact that the search is performed within the employees of the focal firm. For the same reason, the found partners are ‘well known’ to the firm. As mentioned, ‘results’ have been highlighted as additional results when implementing this approach. The profile also indicates the web-platform as a required to implement this suggestion system.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
	Preconditions	Existing infrastructure / tools	none	community	web-platform		
Already known OI-actors		none	single OI-actors	groups of OI-actors			N/A
Concretisation of search direction		rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-14: Approach (7) Suggestion system based open call search (Fairbank &Williams 2001)

**(8) Marketplaces: platforms for open call partner-search (Nguyen et al. 2014)**

This approach presented by Nguyen et al. (2014) talks about ‘marketplaces’. These are online platforms/ communities specially focused on linking ‘seekers’ and ‘solvers’. That means its members are individuals with expertise in some field, experience or just willing to share their innovative ideas. The seeker posts a ‘challenge’, which consists normally in a detailed problem or task to solve, together with a deadline and an offered reward. The latter ensures the motivation and satisfaction of solvers. Then, it is each member who decides whether to develop a solution and share it with the seeker. Afterwards, the seeker selects among the received ideas, and invites the winner to a meeting.

In addition, this approach proposes to implement *Expertise Recommender Systems* to ensure the efficiency and minimize the effort of the search. With these systems, the seeker can introduce its requirements for a partner and the software will find/ propose to the seeker those solvers in the community who match the characteristics. Combining this tool with marketplaces, the partner search becomes much simpler. The only limitation the ER Systems have is that the seeker can only input requirements that match with the options the system offers.

Figure 5-15 shows the profile fulfilled for this approach. As the approach is based on the self-selection of the potential partners, this field has been highlighted on the profile. Moreover, this approach can benefit the firm with both ‘solutions’ and ‘user needs’ as additional results. However, a web-platform as well as the description of the task are needed.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-15: Approach (8) Marketplaces: platforms for open call partner-search (Nguyen et al. 2014)

### 5.3.4 Database Search

This type of search represents all those approaches that are based on a search through a database. A database is basically a summary of data: individuals, organizations, etc. (some kind of stakeholders) but also any kind of knowledge. Therefore, a database can act as an external pool of partners that have been brought together by some criteria. This way, a firm can directly (through a database of some type of stakeholders) or indirectly (through a database of knowledge, that is held by some stakeholder) obtain suitable potential partners. The generic advantage of this search is that most databases are publicly accessible. Anyway, having access to a database is the main requirement for the implementation of these approaches.

The candidates found by using a search of these characteristics will always be ‘technical’ actors; or at least they will be chosen by their technical skills. Accordingly, the result of these approaches is a set of potential partners, chosen by the particular criteria of each one of them (technology similarity, technology complementarity, overlapping knowledge bases, etc.).

In this section, a total of seven approaches are presented, which provide with different methods to look through a database for possible collaboration partner. Even though this cluster is open to future findings, the approaches found so far are all patent databases. Patents are considered to be a very effective source when it comes to discover innovation activities (Byungun Yoon, Bomi Song 2014). Another advantage is that the type of partner that can be found is not limited (except for the condition of having patented something). In other words, in a patent database both individuals and organizations can be targeted as

potential partners.

The goal of the approaches here presented is not only to look specifically for innovation actors, but also for a R&D collaboration partner. This research considers that, even though not being in the Open Innovation context, this kind of search fits the established requirements, and could be easily adapted into a specific OI-partner search.

Nevertheless, there indeed is a downside to this approach: even though patents are a good indicator of innovative activities, not all inventions are patented. So it is useful to identify the areas in which the approach has higher validity (Byungun Yoon, Bomi Song 2014). This means, making sure that for a specific area there exist enough patents, or it is not usual not to patent them.

As a starting point for its implementation, it is not necessary to conduct any previous search. However, it is necessary to decide what the firm is looking for, in terms of technology needs. But when it comes to this point, there is also a general disadvantage. Holzmann et al. (2014) points out that in the early phase of the innovation process, such specific requirements towards collaboration partners are difficult to formulate. In other words, it is not always easy to state the technology needs or specifications on a partner.

The approaches that have been found during this research are:

#### **(9) Technological-complementarity based patent search (Byungun Yoon, Bomi Song 2014)**

The goal of this approach is to search and find candidates for innovation partners, and evaluate their capabilities (Byungun Yoon & Bomi Song 2014). It utilizes the information in a patent database to recognize technological complementarities between the focal firm and the patent portfolios. Therefore, its disadvantage is that only the technological aspects are overviewed, even though the approach suggests that a further exploration of the found candidates should be performed.

The specific procedure, explained in detail in (Byungun Yoon & Bomi Song 2014), is as follows: the patent information is collected and pre-processed (through a morphological analysis) and then represented in a 'map' (based in a *Generative Tool Map*). This is a way to identify technology vacuums. Comparing these gaps with those in the subject company's portfolio, technology opportunities can arise. The candidate partner must be evaluated in terms of technological and cooperative capabilities before establishing any relationships. This shows that the interaction with the candidates is unnecessary until the 'final' selection is made.

If the whole search is considered, the time and effort investment is significant. More than one step is performed and further methods are needed. However, these can be used again for other searches, as they are tools that can help in analyzing any kind of information. These two features can be seen in Figure 5-16. The figure shows the profile of this approach. Result focus has been considered as both qualitative and quantitative because a group of potential partners is found, but their suitability can be assessed in terms of technological opportunities.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-16: Approach (9) Technological-complementarity based patent search (Byungun Yoon & Bomi Song 2014)

#### (10) University-Industry matching system through patent search (Yamada et al. 2013)

This approach presents a program designed to match companies with researchers, and vice versa, using patent and published papers information (Yamada et al. 2013). It has to be used as a tool to analyze the potential partners in a database. The procedure is not complex: when a query is introduced in the system, it returns a set of characteristic words with all the related authors and companies found in the database. Besides, there is also the possibility of searching through the database as a researcher who looks for establishing relationships with the industry. The results are not explicit in terms of quality of the candidates, so the firm gets a group of candidates without more information about them regarding the concerning issue (the program only recognizes the presence of the terms, but not how are they used).

The drawback of this approach is that the output depends entirely of the search terms introduced, so they have to be chosen very carefully. Moreover, the description of such software is not very extensive, so further research would be needed even though the operating principle is clear. So as it is presented in (Yamada et al. 2013) it can only be used as a support tool in the partner search, and thus it has been considered that the preparation and conduction effort is low. However, if obtained, the software can be used for as many searches as the company wants (it is re-usable).

Figure 5-17 shows the profile for this search approach. As mentioned, the field of ‘quantity’ is highlighted for the result focus. The approach provides with no criteria to evaluate the suitability of the found partners. Due to this simplicity, the preparation for this approach has been qualified as ‘low’.

On the other hand, two options have been highlighted for the Identification of potential OI-actors. For the usual implementation of the approach, a company seeking for partners, it will be the OI-team who identifies them. But self-selection has been also considered as the



system also allows a researcher to seek for an industrial partner.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-17: Approach (10) University-Industry matching system through patent search (Yamada et al. 2013)

**(11) Technology-need based patent search (Jeon et al. 2011)**

This approach searches for technology similarities departing from the technology needs of the focal firm (Jeon et al. 2011). Synthetizing data as co-occurrence vectors, a similarity factor is obtained comparing the information in the patents with firm’s capabilities. Then, the final output is a global ranking of the top n potential partners sorted by this factor. Therefore, the ‘quality’ option has been highlighted for the result focus field in the profile (shown in Figure 5-18). The challenge of this approach is to carefully choose the terms to conduct the search, as they will be decisive towards the results.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-18: Approach (11) Technology-need based patent search (Jeon et al. 2011)

With regard to the effort investment, it depends on the means utilized. If the procedure is fully processed by an algorithm, then the conduction is reduced to introduce the search terms and analyze the results. Conversely, if each step has to be performed separately, it involves more time and preparation.

### (12) EEN Database search case study (Holzmann et al. 2014)

This approach seeks for innovative entrepreneurial partners for establishing new bonds outside their usual network. Holzmann et al. (2014) describes three case studies conducted in the context of searching for innovation partners. In this thesis we have taken into account *Case 1*: after the manager defined the search criteria, the intermediary team publishes a technology request on the EEN Database (European Enterprise Network) and actively looks for suitable partners. According to the criteria, they pre-selected a group of candidates among all those who met the technology request. To finally select the most suitable partner, a matching event was organized, so that the firms could prove their mutual understanding. The level of abstraction in the profile (shown in Figure 5-19) has been considered as ‘descriptive’ because the approach is purely based on the case study described.

To conducting this approach, only access to the EEN Database was required. Apart from that, a high time investment was needed, since it describes a several-steps search. However, it is more holistic one: the result is the most suitable partner. Figure 5-19 shows the profile, in which can be seen ‘quality’ highlighted as result focus.

Finally, in Figure 5-19 can be seen that additional results to this approach are solutions. This is so due to the fact that a request is published. Therefore, potential partners can propose solution to said task. In the approach can also be seen that preparation has been considered as ‘high’. The whole approach described in the case study has several stages. Therefore, a relatively high amount of time and effort investment is needed to implement it. However, as the result is very specific (the selected partner) it cannot be re-used for posterior searches.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-19: Approach (12) EEN Database search case study (Holzmann et al. 2014)

**(13) Technological-proximity based patent database search (Angue et al. 2014)**

This approach looks for R&D collaboration partners by measuring the technological proximity using IPC patent classification. The procedure (explained in detail by Angue et al. (2014)) consists in associate each company in the database with a vector representing its technology. Then, these vectors are compared with the technology available in the focal firm. Through this comparison, two magnitudes are calculated: technology proximity regarding general available knowledge of the firms, and technology proximity of a specific field or topic. The results can be graphically visualized using a MDS (MultiDimensioning Scaling) map.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-20: Approach (13) Technological-proximity based patent database search (Angue et al. 2014)

Although, this approach can only be used as a tool to support the partner search. The proposed criteria to select potential partners only cover technological aspects, so a posterior evaluation of other similarities (strategic, cultural...) between the firms has to be performed. These are mentioned in Angue et al. (2014) as relevant when choosing a partner, but not taken into account in the search method.

Figure 5-20 shows the profile fulfilled for this approach. On the one hand, the result focus has been considered as of ‘quality’. This is due to the mentioned magnitudes calculated through the approach, which offer the possibility of compare the potential partners with regard of their technology proximity to the focal firm. On the other hand, the preparation has been qualified as ‘high’ due to the several sub-steps and calculations of the approach. But these magnitudes and technology vectors can be used for a posterior search, so the approach is re-usable.

**(14) Technology recurrence based patent database search (Cordeiro et al. 2014)**

This approach presents a method for looking through a database when a company seeks for R&D collaboration (Cordeiro et al. 2014). This method uses the focal firm’s most typical

technology (its IPC) as a search term. With it, a search is conducted where the output is a table with all the technologies that are linked to that IPC in the database. This means that it shows which other technologies are commonly used when the firm's typical IPC appears, and their frequency of occurrence. To that end, the patents being scanned have to be depicted in vectors. Then, the mentioned specific software (*Weka*) can be run. Apart from that, other sub-methods are used to process the patents (such as Data Mining techniques).

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-21: (14) Technology recurrence based patent database search (Cordeiro et al. 2014)

The main drawback of this method is that only those companies who hold the same technology as the focal firm's most typical IPC. This fact can obstruct radical innovation to happen. Besides, it is stated in the (Cordeiro et al. 2014, p. 3) that the application of this approach is limited to high-tech developer companies, with a medium size patent portfolio (20 to 50).

Figure 5-21 shows the profile for this approach. The result focus has been considered as 'quantity' because several firms are obtained as potential partners. But they are linked to a technology that is related to the most common IPC of the focal firm. Therefore, the focal firm can decide which one of them is more suitable for them as OI-partner. Preparation has been evaluated as low because a software is proposed to perform most of the search.

#### (15) Knowledge distance based patent database search (Baum et al. 2010)

This approach, presented by Baum et al. (2010), proposes a magnitude: 'knowledge distance'. It uses this magnitude to measure the differences in the knowledge backgrounds of firms, and argues that this distance is the one that enables innovation in an alliance. Therefore, the focal company has to set the bounds for this magnitude within which they want to look for a partner.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-22: Approach (15) Knowledge distance based patent database search (Baum et al. 2010)

The output of this search is the set of values representing the distances in the ‘knowledge space’, and has to be interpreted altogether with the established boundaries. But even the mathematical model is given. Guides about the interpretations that have to be made with the results are not specified.

The advantages of this approach are, on the one hand, that it does not require complete information about the knowledge portfolios of the candidates (Baum et al. 2010, p. 20). On the other hand, it promotes specifically radical innovation by ensuring a gap between the company’s knowledge bases.

There are no limitations for applying this approach, except the access to the database. Specific software could be required only if the search wants to be implemented in a higher scale (many candidates at a time).

Figure 5-22 shows the profile fulfilled for this approach. The result is focused on ‘quality’, as the most suitable partner is obtained. Besides, preparation has not been assessed because the methodology is not fully explained in Baum et al. (2010).

### 5.3.5 Pool-based Search

This type of search approach is based on the evaluation of an already existing **pool of candidates**. Their goal is to prove their suitability to the firm and the project being handled. Therefore, the output will be the assessment of a set of potential partners with regard of their innovative abilities and expertise in the field. It can be an abstract evaluation or with numerical values.

Normally, a **pool-based search** will provide with a set of criteria to perform the evaluation. Otherwise, the managers will have to state themselves the criteria they want to assess in the prospective partners. These criteria should cover both strategic and technical skills to ensure

a complete overview of the candidate as a potential OI-actor.

The starting point for applying this approach is having the pool of potential partners to evaluate. Therefore, this search cannot be used from the very beginning, as it would be counterproductive to assess any potential partner. Thus, a Pool-based Search is a 'second step' in the partner search, after a previous rough selection has been performed (selection of the pool of potential partners to be evaluated). It has to be taken into account that the bigger the pre-selected pool of partner is, the higher the effort that will be needed to assess them all.

In addition, a cluster of criteria or aspects to evaluate is the only requirement for this search. As mentioned, they cannot be random criteria gathered together, but a group of chosen characteristics that deal with all the attributes the firm expects the partner to satisfy.

A total of nine approaches with these characteristics have been gathered through the research.

#### **(16) Netnography (Belz, Baumbach 2010)**

This approach is presented by (Belz & Baumbach 2010) as a method to select Lead-Users. It has been categorized as a Pool-based Search because it is based on the assessment of an online community. To that end, no interaction with the candidates is necessary, but only a massive collection of data to be analyzed (interventions of community members, their characteristics, etc.). The main goal, is to identify the Lead-Users of this community through looking for distinctive behavior (Lead-User's characteristic features: dissatisfaction, product related knowledge, experience, etc.). To reduce the amount of members to study, the approach suggests that only the most active ones should be analyzed. Even though that leads to the risk of missing out Lead-Users who participate less, it reduced significantly the investment of time and effort. However, in the profile shown in Figure 5-23 can be seen that the preparation has been evaluated as 'high'. Apart from that, data analysis methods are still useful to lower the high effort investment required.

An advantage of this approach, in comparison for example with other approaches that use social media or communities, is that this one relies on external assessment rather than self-assessment of the potential partners, or the other member's opinion. However, it is equally necessary to conduct a target screening among the found prospective Lead-Users, to check their capabilities and correct identification as Lead-Users. A misjudgment could happen due to the fact that the object of analysis is the communication through a community instead of the complete set of acts of consumers in real life.

Finally, the main requirement for this approach is selecting, and having access to, the adequate online community. This means that the topic of the community has to be related somehow to the issue concerning the firm.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-23: Approach (16) Netnography (Belz & Baumbach 2010)

**(17) Screening (Hippel 2006)**

This approach, mentioned by (Hippel 2006), aims to evaluate a group of individual candidates (users or customers) to search for the Lead-Users. Having access to the desired community is therefore required. The approach consists basically in questioning the whole community about their (and their colleague’s) skills and the field that concerns the firm. However, this means that this approach relies completely on the self-assessment of the interviewed individuals.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-24: Approach (17) Screening (Hippel 2006)

The main required is, therefore, identifying the right community and having direct access to it. Figure 5-24 shows the profile for this approach. In it can be seen that interaction with the

members is necessary. Due to the multiple interviews and their analysis, the required effort is relatively high. However, the actual effort invested will depend on the method for performing the questionnaires (whether it is a personal interview or online questionnaires).

This approach can be implemented to screen a whole community, but also to evaluate a small group of potential partners. That is why in Figure 5-24 different stages of the process are highlighted for its implementation: analysis and assessment of both current and potential OI-partners.

### (18) Cobranding partner pool-based search (Newmeyer et al. 2014)

The goal of this approach is to provide some guidelines to partner selection for a cobranding arrangement (Newmeyer et al. 2014). The *pool* is in this case a group of brands of companies to be evaluated as cobranding partners. The approach suggests conducting first a self-evaluation of the focal brand, and guides the firm in the process. This way the situation of the company is assessed. Then the pool of partners has to be pre-selected. For these selected potential partners, the approach gives a general overview of a partner's main characteristics to evaluate: functional complementarity, hedonic consistency and brand breadth. However, it does not take into account supply-side factors, such as aspects of economics and production (Newmeyer et al. 2014, p. 104).

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-25: Approach (18) Cobranding partner pool-based search (Newmeyer et al. 2014)

Additionally, it provides with a review of different aspects in a cobranding structure, which can be extended to any partnership: integration between partners, exclusivity and duration. It considers its effects in a partnership, and also states a 'mechanism' of attribution to clarify how to make cobranding arrangements to work. In the profile shown in Figure 5-25 this is highlighted in additional results as 'overview of the topic'.

The profile also classifies the approach as not re-usable. There are no sub-methods used, and no additional results are to be used in future searches.

### (19) Cobranding partner pool-based selection (Prince, Davies 2002)



The goal of this approach is to screen potential cobranding partners (Prince & Davies 2002). However, this approach brings a more methodical guideline about the whole process than the one presented by Newmeyer et al. (2014). Also, it provides with more specific features to evaluate on potential partners. The proposed criteria are:

- compatibility
- market volatility
- commitment
- investment required

These offer a holistic study about the strategic skills of the candidate. The main output of this approach is the ‘fitness’ of each candidate as partner for a cooperation strategy. This is a magnitude used to compare the potential partners, and therefore the result focus of this approach is quality. This can be seen on the profile shown in Figure 5-26.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-26: Approach (19) Cobranding partner pool-based selection (Prince, Davies 2002)

The limitation of this approach is that the set of criteria proposed screens basically the strategic skills, but no aspects regarding technological aspects are reviewed. This is due to the fact that the approach is focused on finding partners for a cobranding. But it means that it can only serve as a support in the screening of potential partners, and must be completed with other kind of features regarding other requirements towards the partners.

The only requirement for the approach is to have the pool of potential partners to evaluate. To this end, (Prince, Davies 2002) suggests to search within the brands/firms with the same target audience as the focal firm. That is why it has been considered that the identified potential partners will be vaguely known. Hence, this option is highlighted in the approach.

**(20) OI-quality match pool-based search (Manotungvorapun 2015)**

This approach provides with a method to assess the matching quality of potential partners in the context of Open Innovation (Manotungvorapun 2015). The whole process consists in, first, designing an assessment model through establishing a set of criteria. With regard of

these criteria, the manager/OI-team has to state the requirements for a prospective partner. This means establishing an expected or minimum value for each feature. After this, the potential partners are numerically evaluated by the assessment method, and their matching quality is computed. This result is graphically available through a radar chart, showing the expected values and the scores for each partner. With the radar chart (assessment) of each prospective partner, the decision-makers can select the most suitable, regarding the importance they give to each criterion or the difference between the score of a partner and the ‘minimum’ established.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-27: Approach (20) OI-quality match pool-based search (Manotungvorapun 2015)

The advantage of this approach is that the criteria proposed cover both technological and non-technological aspects of a potential partner. It is indeed mentioned in (Manotungvorapun 2015, p.725) that they have been enhanced in order to make it applicable all kind of partners. Another advantage is the user-friendly display of the output: the radar charts. Although it requires some software to make it possible, it represents in a very clear way the evaluation of the potential partner (what criteria are and are not satisfied).

Figure 5-27 shows the profile for this approach. As the approach offers numerical and graphical support to compare the potential partners, the result focus is considered as ‘quality’. Furthermore, the effort invested in the approach is relatively high due to the several criteria to be evaluated, and the posterior interpretation of the results.

**(21) Innovative capacity-based screening (Matthing et al. 2006)**

The goal of this approach is identifying innovative customers, and then to prove the effectiveness of their employment in an innovation context (Matthing et al. 2006). To that end, a community of customers will be required. The approach proposes a measurable magnitude called *Technology Readiness*, and presents a method to evaluate it (through a TR

Index). This whole method, consisting in interviewing users on a 36-item scale, is not explicitly depicted in (Matthing et al. 2006), but case studies are described showing how the TRI is a good indicator of the innovative predisposition of a customer. It states that those customers who obtain a higher TRI present not only innovative attitude and willingness to participate, but also the capability to generate new ideas. In other words, it could be adapted to be used as an indicator to identify Lead-Users. Therefore, this approach provides with an indicator that can be easily re-usable for other searches. This can be seen in Figure 5-28, that shows the profile for this approach.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-28: Approach (21) Innovative capacity-based screening (Matthing et al. 2006)

As for requirements, only the community of users is needed. Its size will determine the efficiency of the approach. For the screening to be significant, the amount of interviewed customers has to be considerably high.

**(22) Collaborative NPD partner evaluation (Emden et al. 2006)**

This approach proposes a guideline to evaluate potential partners in order to establish a collaborative NPD (New Product Development) alliance (Emden et al. 2006). It defends that the main requirements for a partnership to succeed are:

- technological alignment
- strategic alignment (motivation and goal correspondence)
- relational alignment (feasibility of the co-development)

Strategic and relational alignments ensure the sustainability of the bond, reducing the partnership’s possibility of ‘failure’. These three requirements cover all possible aspects of a partnership, so that it does not need complementary criteria or approaches.

Again, the main requirement is the previous selection of a group of potential partner. Though, it can also be used to evaluate a single prospective partner. This approach suggests that if the focal firm holds an innovative technology or expertise, this would probably attract other companies to approach looking to cooperate with them.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-29: Approach (22) Collaborative NPD partner evaluation (Emden et al. 2006)

Figure 5-29 presents the fulfilled profile for this approach. The results of the approach are only the evaluation of potential partners. Therefore, it has been considered that the preparations for it cannot be re-used. However, the effort investment is not high.

### (23) Criteria-Related Employability Assessment Method (Ripley 1994)

This approach is focused on selecting the most suitable employee among a group. In this case, the *pool* of potential partners represents the candidates for entering a firm. Despite not being specific for innovation partners, it has been included in this thesis to consider its possible adaptation.

(Ripley 1994) offers a methodical support to create a particular selection process, in which the firm can establish its criteria and priorities: the CREAM (*Criteria-Related Employability Assessment Method*). It starts analyzing previous recruitment processes, and then follows a detailed description of the proposed procedure. The output of this model is a “systematic model for employee selection”. This procedure of ‘creation’ includes some other methods, such as workshops, personal interviews and questionnaires. On the whole, it implies a high effort investment regarding preparation and conduction. Anyhow, the result of this approach is very valuable and re-usable.

One of the sub-steps of the process requires interacting and questioning the already existing employees of the firm. This can give an extra output, learning about their interests and ideas.

Overall, this research considers that this approach can be adapted into an Open Innovation context. It could be used as an employability method, but enhancing the requirements to ensure the innovative capabilities of the candidates.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-30: Approach (23) Criteria-Related Employability Assessment Method (Ripley 1994)

Figure 5-30 shows the profile completed for this approach. The identified potential partners have been classified as vaguely known since they already are applicants for the company. Due to the extensive process, the effort investment is relatively high. however, the result obtained is the selection method, that is directly re-usable.

**(24) Innovative capacity-based evaluation (Hunter et al. 2012)**

This approach seeks to evaluate the innovative capacities of the applicants for a company. Hunter et al. (2012) sustains that the recruitment of individuals with such abilities enables the generation of new ideas within a company. It provides with a list of attributes that determine the innovation skills of an employee. It consists on a set of knowledge, skills, abilities and “other” attributes (KSAO characteristics) that predict the creative and innovative behavior. Besides, specific methods to assess the particular features are proposed (e.g. interviews situational judgment tests).

The approach encourages the focal firm to use this attributes to build a selection system. This assessment method could be implemented in the usual recruitment process, but actually its applicability can be enhanced to the assessment of any potential or current employee regarding its suitability to be an innovation partner.

The main disadvantages of this approach are, first of all, that there is no methodical guide apart from the proposed criteria to decide whether to choose or not a candidate. This can be seen in the profile, shown in Figure 5-31. Neither is it possible to compare the evaluation of different candidates with one another, due to the lack of an overall score or magnitude. In any case, some of the attributes are not vastly explained due to space constraints ((Hunter et al. 2012, p. 317).

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-31: Approach (24) Innovative capacity-based evaluation (Hunter et al. 2012)

In conclusion, given a group of pre-selected candidates, this approach offers a set of characteristics to introduce in a selection system as predictors of the candidate's innovative capabilities. As said, the group of candidates to be innovation partners can be both applicants of the company (in which case they are considered as 'vaguely known') or employees of the firm (they are 'completely known then'). Apart from this, it has no further requirements or limitations. Therefore, the approach can be implemented either for analyzing current SHs or for potential ones, as seen in the 'process phase' field in Figure 5-31.

### 5.3.6 Algorithm-based search

Under this category are clustered those approaches that use an **optimization model or algorithm** to select the most suitable partner from a group. They base the selection on the evaluation of different criteria, and normally give an overall score. They offer the possibility to automate the selection process, so less personal effort will be invested (than for example an approach that conducts personal interviews with all candidates) but more software requirements. These approaches have to be considered as a tool to support decision-making in the partner selection process.

The principle of work is similar to the pool-based search. It bases on evaluating a cluster of criteria, with an 'improvement': in this search the criteria will normally be given a weight of importance by the focal firm. This way, each firm can emphasize its priorities and interests towards a partner. But it still has a greater advantage: usually a final overall ranking or score will be computed. This way it becomes much easier to compare and select the most suitable ones. However, a punctual disadvantage of these methods is that the mathematical nature of the algorithms forces the criteria to be evaluated quantitatively. This could cause that the

criteria that have a qualitative structure cannot be measured precisely.

As starting point for implementing this approach, only a group of potential partners to evaluate is needed. Therefore, it may not be necessary but yet helpful to conduct a previous rough search to define the candidates to rank or score. It is useless to evaluate a whole group or actors if actually only a fraction of them are suitable as potential partners. This would mean higher effort investment, in this case unnecessary software computational costs.

This search type requires an **adequate software or computational support** to solve the specific model. Also the group of criteria has to be prepared, if it is not proposed in the particular approach, and their relative importance.

This thesis presents a total of 14 approaches of this kind. They do not limit to the search for innovation partners, but also, for instance, co-development alliances partners. Some of them are very specific approaches to search for other kind of partners, e. g. suppliers, which however show a very efficient selection method. This is why they have been taken into account in this research, to inquire their adaptation to an Open Innovation context.

**(25) Algorithm-based search with production-distribution planning (Su et al. 2015)**

This approach, presented in Su et al. (2015), does not look specifically for innovation partners. Instead, its goal is to integrate partner selection with production, distribution and operations scheduling decisions. The final goal is to minimize the total operating costs related to partner selection and production-distribution of products. To this end, an algorithm has been developed, in which the firm can enter the needed parameters (such as candidate companies, components, etc.) as well as time, location and other constraints. The function returns the most optimal operation schedule in terms of time and cost.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-32: Approach (25) Algorithm-based search with production-distribution planning (Su et al. 2015)

The model works under the conditions of a multi-product, multi-stage, multi-production route, multi-machine and multi-period manufacturing chain. This implies that the operational cost and effort required are both high, due to the many functions to be solved.

Therefore, specific software to solve it will be necessary. This is considered as high preparation effort, as can be seen in the profile shown in Figure 5-32.

Besides, it is also required the set of candidate companies. These companies are supposed to be related to the tasks to be solved. On the one hand, if this approach could be adapted to Open Innovation, it could offer a selection method to a specific kind of company as innovation partners. Also the specific algorithms used (a Genetic Algorithm with Learning Scheme and a hybrid algorithm combining techniques of Particle Swarm Optimization) could probably be re-used (highlighted in the profile). But on the other hand, the cost and effort investment is relatively high. In conclusion, further research is needed to evaluate the possibility of adapting this approach into Open Innovation.

**(26) Algorithm-based search for logistics’ partners (Bueyuekoezkan et al. 2008)**

This approach, like the previous one, is not focused on selecting innovation partners, but ‘e-logistics’ partners (Bueyuekoezkan et al. 2008). In spite of that, this approach does propose a methodical guide to assess the candidates. This assessment method could be adapted to Open Innovation more easily than the one proposed by Su et al. (2015). It consists in identifying the most important criteria, sort them hierarchically, assign them an importance weight (with a fuzzy *AHP*-Analytical Hierarchy Process), and finally conduct the *TOPSIS* (Technique for Order Preference by Similarity to Ideal Solution). The final output is a ranking of the potential partners. The conduction of all of these specific algorithms requires a high effort investment on preparation and performance. Apart from that, the approach requires the pool of potential partners, as well as the adequate software to conduct the algorithms. This characteristics are represented in the profile shown in Figure 5-33.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-33: Approach (26) Algorithm-based search for logistics’ partners (Bueyuekoezkan et al. 2008)

The main advantage of this approach is that it involves two groups of evaluation criteria: strategic aspects and aspects of the partner’s business/technical aspects (such as technical



expertise, performance, managerial experience, etc.). This way, it covers all the features mentioned in the innovation partner selection approaches (except those regarding innovation explicitly). Hence, this research considers the approach to be more suitable for being adapted to innovation partner search that the one extracted from Su et al. (2015).

**(27) Strategic alliance ANP-based search (Chen et al. 2008)**

This approach presents a partner selection method for a strategic alliance with Analytical Network Process (ANP) (Chen et al. 2008). The main idea behind this method is using the interdependence between the criteria for prospective partners and the motivation the focal firm has to forge a collaboration alliance. The process consists roughly in stating the motivation priority of the firm, build a pairwise comparison matrix with respect to criteria and assign weights to the criteria according to the established priorities. A super-matrix is created deriving the relative importance of each criterion. Finally the partner evaluation can be performed, obtaining a suitability index for each candidate. This helps the comparison between candidates and allows a ranking. To compute this mathematical model it is necessary an appropriate software. Apart from that, the other requirement is the group of pre-selected potential partners to evaluate and rank them.

Evaluating the importance of each criterion by a relative weight enables the possibility of adapting the approach to different situations. Hence, the approach can be implemented repeatedly by adjusting the criteria weights. Even though the approach focuses on strategic alliance partners, the main procedure can be easily used for innovation partner assessment.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-34: Approach (27) Strategic alliance ANP-based search (Chen et al. 2008)

Figure 5-34 shows the profile for this approach. The result is focused on ‘quality’ since the approach provides with a suitability index for each potential partner. Moreover, the preparation effort is relatively high due to the multiple steps of the approach.

### (28) Strategic alliance AHP-based search (Chen et al. 2010)

This approach states a methodology for selecting a strategic alliance partner (Chen et al. 2010). The procedure is very similar to the last one, but the algorithm used is an Analytical Hierarchy Process (AHP). The process consists in identifying the motivations and determining their intensity, then calculate the relative weight of each criterion respect to the motivations, and compute the composite relative importance for the criteria. Again the output is an index showing the suitability of every candidate partner.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-35: Approach (28) Strategic alliance AHP-based search (Chen et al. 2010)

A pre-selection of a set of candidates is needed to conduct this search. The other requirement is having access to specific software to conduct the algorithms.

Figure 5-35 shows the fulfilled profile for this approach. The suitability index focuses the result on 'quality'. The interaction with potential partners is not needed to conduct the approach, but it provides with a more accurate assessment. Finally, the preparation effort for this approach is relatively high. However, the suitability index for all the partners and the hierarchy of motivations for the company can become of utility for a future search.

### (29) Co-development alliance algorithm-based search (Bo Feng et al. 2010)

This approach is designed to select the most suitable partner within a group of potential partners to form a co-development alliance. Bo Feng et al. (2010) propose a set of attributes regarding both strategic and technical characteristics:

- Individual attributes: technology capability, financial health, knowledge and managerial experience, capability to access a new market
- Collaborative attributes: resource complementarity, overlapping knowledge bases, motivation correspondence, goal correspondence

They are all expressed in linguistic terms. The decision-makers from the focal firm are

expected to weight the importance given to each attribute with regard to the prospective partner. Then, each potential partner will be evaluated and an overall assessment is obtained through the application of a Fuzzy Multiple Attribute Decision-Making (*FMADM*). With this overall assessment it is possible to construct a ranking of partners, from where the focal firm will extract the most suitable partners with respect to the previously established priorities.

The particular contribution of this approach is that not only the individual utility of each candidate is taken into account, but also the collaborative utility is studied. This aims to reduce the uncertainty of the posterior partnership.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-36: Approach (29) Co-development alliance algorithm-based search (Bo Feng et al. 2010)

Figure 5-36 shows the profile for this approach. As the approach enables a ranking of the analyzed partners, the result is focused on ‘quality’. Potential partners are considered as ‘vaguely known’ due to the fact that they are extracted from a pool of candidates. However, interaction with them is not required to conduct the approach.

**(30) Algorithm-based search with transportation scheduling (Dao et al. 2014)**

The goal of this approach is propose a method of partner selection for multiple projects and transportation scheduling at the same time (Dao et al. 2014). It has been designed in the context of a Virtual Enterprise, to minimize costs while achieving the performance standard.

The procedure has three main steps: establishing the sub-projects that are being delegated, invite other companies to tender those sub-projects and the proposed optimization model (based on a Genetic Algorithm) is run with all the parameters about the focal firm, the potential partners and data about the projects. The output shows the optimal solution of the problem. In other words, the best partner for each sub-project is identified.

It is worth mentioning that the partners may be already known companies, with whom the focal firm has already worked with. Is that why, in the profile shown in Figure 5-37, it has been considered that the partners could be either unknown, vaguely or well known.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-37: Approach (30) Algorithm-based search with transportation scheduling (Dao et al. 2014)

The main advantage of this approach is that it can solve two ‘problems’ at the same time: partner selection for more than one project and the transportation scheduling. For that, it requires the group of potential partners (smaller companies to delegate projects) and the projects that are being delegated. Even though Dao et al. (2014) presents the method with the goal of establishing a virtual enterprise, it has been included in this thesis to contemplate the possibility of adapting it to an innovation context. The projects being delegated could be interpreted as specific tasks for which the firm seeks a partner. In conclusion, this approach can be taken into account as possible method for selecting Open Innovation partners.

### (31) Strategic alliance algorithm-based evaluation method (Wu et al. 2009)

This approach offers another partner selection method for strategic alliance. It is a simpler method of weighting criteria and evaluating the potential partners (through an analytical Network Process). With this, it computes an overall score so that potential partners can be compared and even ranked. In Wu et al. (2009) it is clear that this approach can be used to select any kind of partner, as it describes a study case where the method is implemented to select a supplier.

It stands out the vastly detailed set of criteria proposed in (Wu et al. 2009, p. 4649). They cover different aspects of a potential partner as well as collaborative features. However, it does not offer the possibility to add criteria that might be important to the focal firm.

Another limitation is that it is recommended not to evaluate a high number of candidates at the same time. This is due to the high number of weighted criteria scored. Anyhow, adequate software is required to compute the model.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-38: Approach (31) Strategic alliance algorithm-based evaluation method (Wu et al. 2009)

Figure 5-38 presents the profile fulfilled for this approach. It suggests that potential partners can be either vaguely known or completely unknown, as candidates can be previously known or new external firms. Previously known firms can be also interpreted as already known actors, as indicated in the ‘already known OI-actors’. On the whole, the effort investment is considered as relatively high.

**(32) Market simulation-based search (Atallah 2005)**

This approach presents an original method for partner selection. It consists in running a simulation where three firms invest in R&D and compete out the market (Atallah 2005). The simulator software (required but not specified in the (Atallah 2005)) has information about the firms: whether they have external partners, data about their knowledge bases, etc.

The output of the firm is the best option among the following:

- no cooperation
- cooperation among all firms
- cooperation between only two of them

Also their output in the marketplace is given. In addition, Atallah (2005) gives a general overview of incentives for establishing a partnership, depending on the type of focal firm and its partner.

The only limitation, apart from needing the simulation software, is that only three firms at a time can be studied. The pre-selection of these firms (the focal firm and two potential partners) is not under the scope of this approach.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-39: Approach (32) Market simulation-based search (Atallah 2005)

Figure 5-39 shows the profile for this approach. ‘Quality’ is the focus of its result, as the most profiting partnership is identified. Interaction with the potential partners is necessary to have access to all the specific data needed to perform the simulation. The effort for conducting this simulation is not clear since Atallah (2005) does not provide with details about it. Therefore, the effort investment has not been assessed, leaving the field as Not Applicable.

### (33) Algorithm-based search for a horizontal strategic alliance (Solesvik, Encheva 2010)

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-40: Approach (33) Algorithm-based search for a horizontal strategic alliance (Solesvik & Encheva 2010)

This approach aims to facilitate the evaluation of potential partners for establishing a horizontal strategic alliance (Solesvik & Encheva 2010). It is based in a *FCA* (Formal Concept Analysis) method, in which the potential partners and their expected competences are input. It produces a concept lattice: “a network-like classification structure that can be generated automatically from a term-document indexing relationship” (Solesvik & Encheva 2010, p. 708). It allows the investigation and interpretation of the links between potential partners and their competences. It does not produce explicitly a ranking regarding the suitability of the partner, but a scheme relating all the criteria established with the proposed partners. This way, managers have to interpret and select themselves the ‘best’ partner by choosing the set of criteria they want in a partner. But these results can be re-used in a further search, if the priority of the criteria changes for another partner search.

The *FCA* method is considered to be quite simple and versatile regarding its visual analysis if compared with other mathematical approaches, such as *AHP*, *ANP*, etc. (Solesvik & Encheva 2010, p. 712). However, the output is comprehensible only when lattices are not too big, so a large number of partners and competences is not recommended. Another limitation regards the difficulty of gathering all the necessary information about the potential partners in the selection process (Solesvik & Encheva 2010, p. 712).

**(34) University-Industry algorithm-based search (Ning, Xue-wei 2006)**

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-41: approach (34) University-Industry algorithm-based search (Ning & Xue-wei 2006)

This approach intends to help companies that want to establish a long term University-Industry relationship. It consists in weighting a whole list of criteria and sub-criteria by fulfilling special questionnaires, and then analyse the interrelationships applying *ANP* (Analytical Network Process). Also an Interpretative Structural Model (*ISM*) method is used to clarify the evaluation system. This being done, potential partners can be assessed and selected or rejected depending on their evaluation.

Compared with selection methods based on *AHP*, the use of *ANP* and *ISM* gives this approach a broader significance. Another is that interactions between criteria are taken into account in the weighting system. The set of criteria cover both technical and strategic

aspects, so this approach can be used by itself as an assessment method.

**(35) Decision support system for innovation partner selection (Hacklin et al. 2006)**

The goal of this approach is to provide an overview of potential venture partners to the decision-makers of the focal firm (Hacklin et al. 2006). To this end, it proposes the used of the DS4iP model: a decision support system for strategic innovation partner selection. First, a list of criteria to characterize the firms has to be fulfilled by the focal firm. It has been transformed into interrogative issues to make the process easier, and it have three layers of criteria: strategy, cultural and structural criteria. This characterizing is recommended to be performed in an anonymous way (towards the potential firms). Then, the model can be conducted. Further detail about the model is explained in (Hacklin et al. 2006, p. 104). The output of the software is “a cockpit chart summarizing the main outcomes of comparing the two benchmarked firms” (Hacklin et al. 2006, p. 109)

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	Result focus	quality	quantity				N/A
	Degree of newness	well known	vaguely known	completely unknown			N/A
	Degree of interaction	none	useful	necessary			N/A
	Type of method	open search	search within a pool of potential partners		assessment		N/A
	Identification of potential OI-actors	OI-project team	other actors	self-selection			N/A
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	Additional results	overview of topic	user needs	solutions			N/A
Preconditions	Existing infrastructure / tools	none	community	web-platform			N/A
	Already known OI-actors	none	single OI-actors	groups of OI-actors			N/A
	Concretisation of search direction	rough topic	precise terms	definition of task			N/A
Effort	Preparation	low	high				N/A
	Re-usability	no	yes, adapted	yes, directly			N/A

Figure 5-42: Approach (35) Decision support system for innovation partner selection (Hacklin et al. 2006)

This method is appropriate for implementing in a one-to-one basis. So this approach can be considered as an assessment method to prove the suitability of the selected prospective partners. How to pre-select these prospective partners is not explained in (Hacklin et al. 2006), but a previous search has to be performed to reduce the candidates. As they have been previously selected, they are considered to be vaguely known when implementing this approach.

In conclusion, this method requires a pre-selected pool of prospective partner and the specific software presented. As the method is based entirely on the DS4iP model, this has not been considered as a sub-method. As a consequence, in the profile it states that the “invested preparation or search results” cannot be used for other searches, as the model itself is the one that can be used again for other searches.

**(36) Multi-Aspect Partner and Service Selection**



**Method (Paszkievicz, Picard 2010)**

This approach found in (Paszkievicz & Picard 2010) presents the *MAPSS*: a Multi-Aspect Partner and Service Selection Method to support the planning of a Virtual Organization. Its goal is to select appropriate partners to specific roles. First, the VO specifications have to be defined (requirements and preferences). A selection of candidate partners has to be assigned to each role within the VO, and then the most fitting partner to each role is obtained using Genetic Algorithms (more detailed procedure can be found in (Paszkievicz & Picard 2010)). This implies that no completely new partners will be found. Instead, only the ones already chosen as candidates will be ranked regarding their suitability for a specific role or task.

It is clear that this approach does not look specifically for innovation partners. Despite that, it integrates the evaluation of “competencies, social aspects and performance” (Paszkievicz & Picard 2010, p. 336), so as it reviews both strategic and technical skills of the potential partners, it is here considered as potential Open Innovation approach.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-43: Approach (36) Multi-Aspect Partner and Service Selection Method (Paszkievicz & Picard 2010)

To conduct this model, the focal firm has to pre-select a group of candidates for each designed role. Therefore, also a list of defined roles is required (the ‘definition of a task’ defines the search direction), for which the focal firm looks an external partner. Finally, software to run the algorithm is obviously essential.

**(37) Algorithm-based supplier search (Feng et al. 2011)**

The goal of this approach is to select the most suitable supplier/s among a group of candidates for the provision of different SPE, to create a long-term relationship (Feng et al. 2011). Despite the search approach is not focused on innovation partners, it has been included in this research to contemplate the possibility to adapt it and obtain a selection approach to find innovation partners within suppliers.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-44: Approach (37) Algorithm-based supplier search (Feng et al. 2011)

The basis of the search is similar to the other algorithm-based ones: given a set of pre-candidates, the focal firm has to define the collaborative criteria depending on the type of firm and issue concerned. A short list of them is proposed, and some of them are specific criteria for suppliers. Then the candidates are evaluated and an overall score is obtained for each of them. After that, the focal firm defines the objectives and constraints, and a multi-objective algorithm based on TS is used to solve the optimisation model (that seeks to minimize costs and time maximizing collaboration utility between partners). The final output will assign the most suitable partner for a specific task.

The advantage of this approach vs. other supplier selection methods is that it takes into account not only individual but also collaborative utilities. This makes it suitable to be adapted into Open Innovation.

### (38) Algorithm-based supplier search with qualitative and quantitative data (Toloo, Nalchigar 2011)

This approach also aims to select the most efficient supplier among a group (Toloo & Nalchigar 2011, p. 14726), in this case in presence of both ordinal and cardinal data. Given the set of candidates, this approach uses *DEA* (Integrated Data Envelopment Analysis) to obtain the most suitable suppliers ranked by their ‘efficiency’.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-45: Approach (38) Algorithm-based supplier search with qualitative and quantitative data (Toloo, Nalchigar 2011)

The pool of pre-selected suppliers is required to conduct the method, and both qualitative and quantitative data can be taken into account. Also, adequate software will be needed to solve the model, even though it only needs one mixed integer linear programming (MILP) to be solved.

Regarding the suitability of this approach for an Open Innovation context, the method presented by (Toloo & Nalchigar 2011) cannot be directly used. The major drawback is the lack of any strategic/collaborative evaluation. Only technical data of the suppliers are used to measure their efficiency. Therefore, it cannot be used on its own, but it need another approach or evaluation method to complement and ensure the evaluation of both technical and strategic skills.

**(39) Criteria-based ranking method (Afshari et al. 2010)**

This approach aims to select the best amongst five individual by ranking them (Afshari et al. 2010). The approach is focused on evaluating potential employees, but its applicability can be enhanced to innovation partners (in this case: individuals, not firms) by modifying the criteria. The generic procedure is similar to many seen before: First, selecting relevant criteria and assigning an importance weight. Then, collect the necessary data about the candidates and evaluate them. Finally, they are ranked regarding their suitability by an overall score. What this approach introduces in the process is a consistency check: a sub-step in the process to check that the computed weight of criteria match the original priorities.

Goal	Process phase	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies		
	Result focus	quality	quantity				N/A		
	Degree of newness	well known	vaguely known	completely unknown				N/A	
	Degree of interaction	none	useful	necessary				N/A	
	Type of method	open search	search within a pool of potential partners		assessment			N/A	
	Identification of potential OI-actors	OI-project team	other actors	self-selection				N/A	
	Level of abstraction	general overview	abstract guide	methodical guide	descriptive	implementation case			N/A
	Additional results	overview of topic	user needs	solutions				N/A	
Preconditions	Existing infrastructure / tools	none	community	web-platform				N/A	
	Already known OI-actors	none	single OI-actors	groups of OI-actors				N/A	
	Concretisation of search direction	rough topic	precise terms	definition of task				N/A	
Effort	Preparation	low	high				N/A		
	Re-usability	no	yes, adapted	yes, directly				N/A	

Figure 5-46: Approach (39) Criteria-based ranking method (Afshari et al. 2010)

An advantage of this method is that its simplicity allows the use of usual software as MS Excel to run it, and the processing time is not very high in comparison with more complex algorithms. In spite of that, it is considered that the preparation and conduction of the approach involve a 'high' effort investment on the whole, due to the several steps to perform and the fact that an algorithm has to be solved. In this case, the SAW method is used to rank the candidates, and a Saaty's 1-9 scale for the pairwise comparison.

## 6 Assessment of OI-partner-search approaches

An assessment methodology has been developed to evaluate each approach regarding its suitability to Open Innovation. In other words, to evaluate how suitable is each approach to be used as a search method for innovation partners in an OI project. To that end, this section presents the proposed method to assess innovation partner search approaches. Then, the approaches found in this research will be assessed through the methodology proposed.

### 6.1 Assessment methodology

To assess the search approaches that have been found with regard to its suitability in OI, a systematic method is needed. To maintain the consistency of the whole research, the requirement list stated in section 4 is going to be used as a systematic assessment pattern. That list of criteria presented in Section 4 was the characteristics the research looked for when seeking out for partner search approaches. Now, it will be checked if the search approaches actually satisfy those criteria.

Therefore, the next sub-section will review every approach and study if they fulfill, partly fulfill or not fulfill at all the requirements. To that end, each requirement has four values: **YES**, **PARTIALLY**, **NO** and **N/A** (Not applicable). As can be seen in Figure 6-1, these four values have been added to the requirement table as four columns at the right side. For each requirement, it will be needed to select between:

- **YES**, if the particular requirement is fulfilled by the search approach
- **PARTIALLY**, if the approach can fulfil the requirement but only to some extent, or just in some cases
- **NO**, if the requirement is not satisfied by the approach
- **N/A**, if the requirement cannot be assessed in that particular approach, or if the approach does not have enough information to assess it

Regularly, the approaches will be assessed regarding the explicit information stated in their source. If a requirement can be assessed (either fulfilled or not) but there is no explicit information in the source to refer to, they will be assessed through interpretation. The fields that have required own assessment are identified with (\*).

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities				
1.2 Provide an overview of the strategic relevance of the potential partners				
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				
2.2 Not require the publication of internal information, to prevent knowledge drain				
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only				
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable				
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				
3.2 ... have an absorptive competence				
3.3 ... have an integration competence				
3.4 ... have the competence to maintain control over a project				
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners				
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description				
4.2 Look specifically for innovation partners				
4.3 Rank potential partners according to their suitability to the project				

Figure 6-1: Assessment table

All the approaches have been assessed by this methodology. The assessment of each of them can be found in the Appendix 3. But the next sub-section will present an evaluation of each cluster on the whole to show a representative assessment. This is valid because, as can be seen in the cluster's definition in Section 5.1, the groups of approaches have multiple common attributes, even though their specifications vary.

Even though all requirements are equally assessed, not all of them have the same importance towards their use or validity. This will be explained with more detail with the assessment of each cluster, differentiating the essential requirements of the complementary ones for each of them. But first, the assessment criteria will be explained. That is, by which criteria is each requirement fulfilled or not.

### 6.1.1 General requirements for OI

The 'General requirements for OI' category is composed by two requirements. These requirements ensure that all the skills that can be involved in OI are reviewed (technical and strategic). As has been mentioned through the thesis, the technical and strategic skills of potential partners are the two dimensions to be taken into account to determine the relevance of potential partners (Gürtler & Lindemann 2013, p.5). So far, any approaches have been found in the literature that integrate the both perspectives (Gürtler 2014, p. 57).

- **Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on**

**customer/market needs or about solution possibilities.** It will be fulfilled if the approach evaluates the technical skills of the potential partners with regard of the issue being held (the field of the project). The partial or full satisfaction of this requirement will depend on the depth of the analysis: if the technical skills are just overviewed or deeply evaluated. Instead, it will be not fulfilled if the approach does not take into account the technical skills of the partner.

- **Provide an overview of the strategic relevance of the potential partners.** Analogously to the technical skills, the approach will not fulfil this requirement if the strategic skills of the potential partners are nor regarded. If they are, the depth of the analysis of the strategic influence will determine whether the requirement is partially or fully fulfilled. It will be considered as fully satisfied if the approach focuses on strategic alliances.

Generally, these approaches have to be somehow (completely or partly) fulfilled. If one of them weren't fulfilled, means the particular approach does not check by itself all the important attributes of a potential partner, and therefore would need to be complemented by another approach to ensure the holistic study of the partner. If the focal firm does not specify the type of 'influence' they expect from the partner, both perspectives should be taken into account. This means that if the focal firm only looks for a strategic partner, checking its technical skills is not necessary. In conclusion, this requirement indicates if the assessed approach can be implemented on its own for a holistic search, or further approaches are needed.

### 6.1.2 Requirements for reducing risks

From this second group of requirements, the satisfaction of none of them is essential. They all provide the approach with an extra contribution for the focal firm. This means that the more of them are satisfied, the better. But if they weren't, that would not mean an obstruction for its implementation. In this case, depends on the firms priorities: when choosing an approach, the focal company should state which of the complementary requirements are imperative for them.

- **Analyse the motivation and/or interests of potential partners in cooperating.** This requirement will be satisfied if the approach specifically takes into account the motivation or interest of the potential partners (both by themselves or promoting it with incentives) in participating in the project. The approach will be fully satisfied if their motivation is a condition for their selection or if it includes an incentive's system.
- **Not require the publication of internal information, to prevent knowledge drain.** It will be mainly fulfilled if the approach does not require letting out any information (no interaction with the partners) or if it specifies the avoidance of knowledge drain. It will be partially satisfied if the interaction with the potential partners does not involve the real topic about which the OI project is about (e.g. gathering generic information about them). Otherwise, the requirement will not be fulfilled, as it cannot be ensured the amount of information transferred.
- **Not focus in customers as potential partners, to avoid the dependence on**

**customer views, demands and personality only.** This requirement will not be fulfilled if the approach focuses on customers as potential partners. However, it will be partially fulfilled if it focuses on customers as potential partners but includes specific actions to avoid the dependence on their demands and personality. That means, that even the approach looks specifically for customers, it tries to e.g. diversify their origins. This way it can avoid choosing customers that only represent a small group of them. The satisfaction of this requirement is however not important if the firm seeks to integrate a customer from a specific community or group.

- **Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable.** If the firm already looks for a specific type of partner, it is a requirement without importance. But if it is not the case, it is quite relevant that the approach ensures an overview of all kinds of partners. It will be fulfilled if the approach is an open search and the type of partner is not defined.
- **Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation.** The criterion to assess the fulfilment of this requirement is a subjective matter. The requirement will be considered as satisfied if the type of partner searched/found has ever proven its capabilities to innovate in a radical way (patent's owners, or Lead-Users). In this research it is considered that then they may do it again. Otherwise, it will be partially fulfilled if the approach explicitly mentions the condition of radical innovative capacities from the partners. The satisfaction is here considered as 'partial' because the requirement from the focal firm does not ensure that the identified partners actually have those capacities. Finally, it has been considered that other potential actors may also be capable of producing radical innovation, but it cannot be ensured through the approach. Therefore, the requirement will not be fulfilled. This requirement is generally not fundamental for all partner search approaches. If an approach does not ensure the possibility of gaining partners with the capabilities for providing with radical innovation, it would still be a reliable approach. But maybe a firm in particular seeks an OI-partner to develop radically new technology. In this case, they would have to state that this requirement is essential in their search for a partner search approach.

### **6.1.3 Requirements with regard to the company**

With regard to the third part, 'Requirements with regard to the company', they are also not vital each by itself, but they can be on the whole. Having a disclosure, absorptive and integration competence is not essential, but if none of them is satisfied then the approach may not be suitable for implementing in OI. This is due to the fact that these three characteristics are basic attitudes expected by a company willing to engage in an Open Innovation project. they regard the company's attitude towards potential partners.

- **Allow and support the company to have a disclosure competence.** Having a disclosure competence can be proved by letting information out to the potential partners or other publics. Even though this can collide with avoiding knowledge drain, it is the way to satisfy this requirement. Otherwise, it cannot be assessed



whether the approach supports the company to show this attitude or not. It will be partially fulfilled if the approach involves the delivery of information, but this information is not related with the project. This can be e.g. interacting with the potential partners to evaluate their general characteristics or learn more about them.

- **Allow and support the company to have an absorptive competence.** The absorptive attitude is checked if the approach encourages the company to see external knowledge or know-how as its own (e.g. adopting technologies developed elsewhere). This involves policies to protect the co-produced knowledge, and specific actions against the “Not-Invented-Here”- syndrome.
- **Allow and support the company to have an integration competence.** This requirement will be satisfied if the approach looks for a partner to solve a specific task or input a specific knowledge to be integrated or used in the company’s process.
- **Allow and support the company to have the competence to maintain control over a project.** This requirement looks for ensuring the commitment of all the parties during the project. For this, it has been fixed that it will be fully satisfied if the partnership is regarded as a hiring contract (e.g. a Virtual Organization, or a firm looking for other sub-companies or employees). Otherwise, it will be partly fulfilled if the commitment of the potential partners or a long-term project are taken into account in the approach as selection criteria.
- **Allow and support the company to identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners.** This requirement will be fulfilled if an identified team/individual is mentioned to be in charge of establishing the partnership or performing the partner search. It will be partially fulfilled if interaction with candidate partners is required. This action forces the company to select a team to conduct this part of the partner search. If there is no interaction at all, and no specific department of the firm is mentioned to be responsible of the partner search, it will not be fulfilled.

#### 6.1.4 Requirements for approach efficiency

To conclude, the last set of requirement review the approach efficiency. By efficiency is considered how useful or helpful would it be for a company to implement this approach with regard of the identification of innovation partners. Three aspects are considered:

- **Contain a detailed step-by-step process description.** If the approach has a structured procedure, and the company implementing it has only to apply them, this requirement is fulfilled. If it provides with a structured procedure, but the description of the steps to be followed are not fully specified, it will be partially fulfilled. Otherwise, the approach can be a collection of recommendations or hypothesis. Then it will be not fulfilled at all. This field is linked to the profile sheet field ‘level of abstraction’: the requirement is satisfied if a ‘methodical guide’ is given, and partially satisfied if an ‘abstract guide’ is provided. This requirement is relatively important: approaches with a methodical process of implementation are considered of “higher quality” than those who provide with a set of statements about partner selection, but do not specify a procedure to select them.

- **Look specifically for innovation partners.** This approach indicates the readiness of the approach to be implemented in an OI context. The fulfilment is clear: if the partners considered in the approach are searched to innovate with them. Here have been considered R&D alliances, as their ultimate goal is to develop new technologies together. Otherwise, if the approach is designed to select other kinds of partner it will not be fulfilled. However, it will be partially fulfilled if it seeks for a partnership between e.g. two firms. As mentioned, if it is fulfilled means that this approach could already be applied to select Open Innovation actors. If it is not, implies that the assessed approach needs to be modified in a greater or lesser extent.
- **Rank potential partners according to their suitability to the project.** The answer is positive if the results of the approach are more or less conclusive: this means that through this approach the firm targets the best partner among a group (regardless of the group). Examples of this output are a ranking of the best partners, a comparable score or identification of an individual (or more than one, but by their individual characteristics, not as a group). The requirement will be fully satisfied if the output of the approach is specifically a ranking or score of partners regarding their suitability. It will be only partially fulfilled if the approach provides with a method to compare the potential partners, but the most suitable one among them has not been identified. On the contrary, if the approach delivers e.g. a type of partner, a community, a group, a search direction, etc. it does not satisfy this requirement. The importance of this requirement relies on its consequences: if it is completely or partially fulfilled implies that no further searches have to be performed to find the most suitable partner. Otherwise, the partner search is not concluded, as the results are not a partner with whom to collaborate and another approach should be applied in order to identify it.

## 6.2 Assessment of found approaches

This section presents the evaluations of the clusters of approaches. The particular assessments for each approach can be found in the Appendix 3. The assessment will be done in regard of the general characteristics of each search type.

For each cluster, a general assessment has been made. This means, the assessment evaluates the generic characteristics of the type of search, but not necessarily of all approaches in the cluster. When a specific approach does not fit into the general assessment of its cluster, it will be mentioned. If necessary, the individual assessment of the approach will be given.

To simplify the references to the evaluation of each requirement, they will be referred to with their number in bold letters; for instance “Requirement (2.2) Not require the publication of internal information, to prevent knowledge drain” will be abbreviated as **(2.2)**.

### 6.2.1 Open Search Approach Assessment

A representative assessment table for an Open Search is shown in Figure 6-2. All the

approaches within this cluster are general searches that mostly help the firm to establish a search direction. Because of that, the first set of requirements is hardly fulfilled. Technical skills (1.1) are normally taken into account, but full knowledge about their technological capabilities is not achieved due to the lack of an in-depth analysis. Anyhow, the solution potential is increased. However, the strategic relevance of the potential partners (1.2) for the project is almost impossible to gain.

Regarding the requirements for avoiding risks, open searches are normally conducted internally by the firm. That means that there is no interaction with the potential partners, and therefore their motivation cannot be ensured (2.1). Also, not interacting with the candidates implies that no information is leaked (2.2). Because of the open nature of this type of approach, requirements (2.3) and (2.4) are satisfied, as many kinds of partners are included. Finally, as not even the type of partner is known, is it not possible to assess whether it will be able to contribute with radical innovations (2.5).

As for the third set of criteria, the approaches usually do not support the company to have a disclosure competence (3.1), as interaction between the firm and the potential partners is not given. Requirements (3.2) and (3.3) have been assessed as partly satisfied by own assessment. These approaches mention importance of the integration and absorption of the external gained knowledge, but do not actually specify methods to ensure it.

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic relevance of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence			X	
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project				X
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description			X	
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project			X	

Figure 6-2: Representative assessment for Open Search Approaches

Requirement (3.4) cannot be assessed due to the lack of interaction with or identification of the potential partners. Therefore, the type of cooperation to be established is unknown. Last

requirement in this category (3.5) is usually not fulfilled by this type of approach. Again due to the lack of interaction with the potential partners, no team or department in the company is identified to be responsible for the proper communication with the external actors.

To conclude, the evaluation of the last group of criteria is as follows: open searches do not provide with a detailed procedure about how to apply them (4.1), as they are more of general overviews. Conversely, all of them explicitly look for innovation partners (Chen 2014, p. 921), (Li et al. 2008, p. 315), (Desouza et al. 2008, p. 35) so requirement (4.2) is always fulfilled. And finally, as mentioned in the assessment methodology, the last requirement (4.3) is not fulfilled. This is due to the fact that these approaches help the firm establish the search direction, so their output is a group or type of potential partners.

An exception in this cluster is approach (3) **Customer-type based open search (Desouza et al. 2008)**. The requirements in which this approach differs from the other open searches can be seen in Figure 6-3. The search involves interaction with the potential partners, even though the level of interaction is low. Therefore, requirement (2.2) is only partly fulfilled for this approach, and requirement (3.5) is completely fulfilled. But it is an open search with focus on the customers, so requirements neither (2.3) nor (2.4) can be fulfilled. Regarding the *customer-driven* innovation, it is normally very difficult for organizations to control the process (Desouza et al. 2008, p. 43), so requirement (3.4) is also not satisfied. Finally, this specific approach is not only a general overview of the partner search, but offers an abstract guide for it. Therefore, requirement (4.3) is partly fulfilled.

(3) CUSTOMER-TYPE BASED OPEN SEARCH (DESOUZA ET AL., 2008)		YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>					
1.1	Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2	Provide an overview of the strategic relevance of the potential partners			X	
<b>2 Requirements for reducing risks</b>					
2.1	Analyse the motivation and/or interests of potential partners in cooperating				X
2.2	Not require the publication of internal information, to prevent knowledge drain		X		
2.3	Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only			X	
2.4	Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5	Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>					
The approach must allow and support the company to ...					
3.1	... have a disclosure competence			X	
3.2	... have an absorptive competence		X(*)		
3.3	... have an integration competence		X(*)		
3.4	... have the competence to maintain control over a project			X	
3.5	... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>					
4.1	Contain a detailed step-by-step process description			X	
4.2	Look specifically for innovation partners	X			
4.3	Rank potential partners according to their suitability to the project		X		

Figure 6-3: Assessment of approach (3) Customer-type based open search (Desouza et al. 2008)

### 6.2.2 Network-based Search Approach Assessment

In this cluster there is so far only one approach ((4) Pyramiding (Hippel 2006)). However, the representative assessment shown in Figure 6-4 has been made regarding the generic characteristics of the type of search.

About the general requirements, this approach satisfies requirement (1.1), as the users are questioned after theirs and other’s expertise. For the same reason, the general requirement (1.2) is not fulfilled, due to only their technical expertise is evaluated.

Turning on to the requirements for reducing risks, this type of search does not provide with enough information to evaluate its position towards the actors’ motivation (requirement (2.1)). Instead, it partly satisfies requirement (2.2), as there is interaction with the potential actors. This interaction involves questioning them about skills in a specific field, so it has been considered as gathering information about them. Neither requirement (2.3) nor (2.4) are fully satisfied: this type of search is always focused on a type of partner, through which the approach will scan for the most suitable partner. Therefore, requirement (2.4) is never fulfilled. However, requirement (2.3) is here marked as partly fulfilled because it will depend on the type of partner the approach focuses on. For instance, approach (4) **Pyramiding (Hippel 2006)** does not fulfill at all this requirement, as is focused on customers as potential partners.

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain		X(*)		
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only		X(*)		
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence		X(*)		
3.2 ... have an absorptive competence				X
3.3 ... have an integration competence				X
3.4 ... have the competence to maintain control over a project				X
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

Figure 6-4: Representative assessment for Network-based Search Approaches

Requirement (2.5) cannot be assessed due to the lack of approaches in this cluster. In particular, approach (4) partly fulfills it (through self-assessment) as the identified potential

partners are Lead-Users, and they are expected to have the abilities to produce radical innovation.

As for the third set of criteria, the approach supports the company to have a disclosure competence, since it requires interaction with the candidate partners but this interaction does not need to involve the specific issue of the OI-project. Therefore, requirement **(3.1)** is partly fulfilled. For the same reason also requirement **(3.5)** is also fulfilled. Instead requirements **(3.2)**, **(3.3)** and **(3.4)** **cannot** be evaluated.

With regard to the approach efficiency, requirement **(4.1)** as for the approach we have so far (Pyramiding) there is an abstract guide for its conduction. But it cannot be assessed whether future network-based search approaches will fulfill this requirement. Instead, they do specifically seek for innovation partners, so requirement **(4.2)** is completely fulfilled. Finally, the approaches do not provide a ranking of the potential partners regarding their suitability to the OI-project. But normally the most suitable/capable one(s) are identified, so the requirement **(4.3)** is partly fulfilled.

### **6.2.3 Open call Search Approach Assessment**

Regarding the Open call Search Approaches, the assessment can vary from approach to approach. This type of search is based on the self-selection of the potential partners. To this end, the company normally publishes a request on a specific platform and waits for potential solvers to respond to it. Therefore, main elements of influence in this type of search are the platform where the search is made and the request made. A representative assessment is shown in the Figure 6-5.

As for the general requirements from OI, requirement **(1.1)** should always be satisfied by this type of search: desired technical skills of potential partners are ensured since the firm itself defines and publishes the technical problem to be solved. Instead, the strategic relevance of the identified potential partners **(1.2)** cannot be analyzed.

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities	X			
1.2 Provide an overview of the strategic relevance of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating	X			
2.2 Not require the publication of internal information, to prevent knowledge drain			X	
Not focus in customers as potential partners, to avoid the dependence on customer views,				
2.3 demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X(*)		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence	X			
3.2 ... have an absorptive competence			X	
3.3 ... have an integration competence	X			
3.4 ... have the competence to maintain control over a project				X
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X(*)		

Figure 6-5: Representative assessment for Open call Search Approaches

As for the second set of criteria, requirement (2.1) is always fulfilled. This is due to the fact that potential partners are identified through self-selection. Therefore, they are already showing their interest in cooperating in the development of a solution to the published problem. On the contrary, knowledge drain is an actual risk not prevented through these approaches. Making the request consists specifically in the publication of an internal problem to be solved; this leads to no fulfilling requirement (2.2). Any of the identified approaches here presented specify how to make the call in order not to let out too much information.

Generally, requirement (2.3) and (2.4) are fulfilled, but it depends on the platform used to broadcast the request or approach the solvers. If this platform is not to be used by a specific type of partner, but by solvers from different sources, then both are satisfied (e.g. approach (8) **Marketplaces, platforms for open call search** (Nguyen et al. 2014)). If the platform is focused on a type of partners, but not customers or users, (2.3) is fulfilled but (2.4) is not (e.g. approach (7) **Suggestion system based open call search** (Fairbank & Williams 2001), which focuses on employees as potential partners). And if the platform is used by users, they are both not satisfied (e.g. approach (6) **Social media as an OI-tool** (Mount & Garcia, 2014), which uses social media to let the firm be reached out by customers and users).

Finally, requirement (2.5) regarding radical innovation is partly fulfilled (through own assessment). It has been considered that the firm can review these solutions proposed by the solvers before considering them as potential partners. Therefore, the firm itself can identify

the most innovative ones.

Turning on to the third group of criteria, supporting a disclosure **(3.1)** and integration **(3.3)** competence is normally satisfied. The firm is required to publish internal problems, and the final goal of this method is to use the gained solutions in their own process. As for the absorptive competence **(3.2)**, this type of approach does not cover how should the firm treat the gained solutions with regard of intellectual properties, and is therefore not fulfilled.

Regarding the control over a project **(3.4)**, in general it cannot be assessed for this type of approach, as they do not consider the whole project but only a specific task or problem to solve, for which they look for a partner. An exception is made for approach (7), where the approached partners are employees, are therefore the project would take place within their same firm. It has been considered that in this case, the manager can maintain control over its employees. Finally, requirement **(3.5)** is always satisfied by this type of search, as there is a selected team or individual who is responsible of having access and launching the call through the platform, and afterwards interacts with the solvers. It would be considered the 'gatekeeper'.

To conclude, the last set of requirements **(4.1)**, **(4.2)**, **(4.3)** is fully satisfied by approach (8), which makes it a highly efficient approach in terms of identifying eligible partners. Requirement **(4.1)** is indicated as partly fulfilled because approaches (6) and (7) do not fulfill it: the first one is more of a descriptive approach, so no step-by-step procedure is provided; the latter presents various sub-methods in order to implement it but there is no whole overview of the approach. However, all of them satisfy indeed the last two requirements: on the one hand, all open call search approaches found seek for innovation partners **(4.2)**. On the other hand, the last requirement **(4.3)** is partly fulfilled through self-assessment, considering that the most suitable partners are identified in regard of the broadcasted request, but there are normally more than one of them. Furthermore, normally this type of approach requires a posterior screening to check that the identified partners they are really suitable for the project.

#### **6.2.4 Database Search Approach Assessment**

Database Search Approaches only seek for partners by technical criteria, through knowledge databases. Its assessment table can be seen in Figure 6-6. As can be seen in Figure 6-6, only requirement **(1.1)** is fulfilled out of the general requirements from OI the first general requirement from OI. Strategic relevance of potential partners is never covered by these approaches. That implies that the requirement **(1.2)** is almost never fulfilled.



		YES	P	NO	N/A
1	<b>General requirements from OI characteristics</b>				
1.1	Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities	X			
1.2	Provide an overview of the strategic skills of the potential partners			X	
2	<b>Requirements for reducing risks</b>				
2.1	Analyse the motivation and/or interests of potential partners in cooperating			X	
2.2	Not require the publication of internal information, to prevent knowledge drain	X			
2.3	Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4	Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5	Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X		
3	<b>Requirements with regard to the company</b>				
	The approach must allow and support the company to ...				
3.1	... have a disclosure competence				X
3.2	... have an absorptive competence		X		
3.3	... have an integration competence		X		
3.4	... have the competence to maintain control over a project			X	
3.5	... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
4	<b>Requirements for approach efficiency</b>				
4.1	Contain a detailed step-by-step process description	X			
4.2	Look specifically for innovation partners	X			
4.3	Rank potential partners according to their suitability to the project		X		

Figure 6-6: Representative assessment for Database Search Approaches

From the second set of criteria, requirement (2.1) cannot be assessed due to the lack of contact with the potential partners. Only approach (10) **University-Industry matching system through patent search (Yamada et al. 2013)** explicitly expects from the other party to be also interested by itself in collaborating (Yamada et al. 2013, p. 397). The rest of requirements regarding the prevention or risks are by rule satisfied by the Database Search Approaches: the company does not need to interact with the potential partners (2.2); the partners reached are those found in the database, and they will not usually a specific type ((2.3) and (2.4)). In particular, most of the approaches found in this cluster are patent database search approaches. Therefore, the potential partners identified are firms or individuals who have already proven to be able of radical innovation (2.5). This requirement is marked as partly satisfied, since it is satisfied for the approaches found so far in this research. But as not all database searches are necessarily a patent database search, it is not a characteristic of the type of search.

A disclosure competence from the company cannot be assessed since no interaction takes place during the approaches. Only in the approach (12) **EEN Database search case study (Holzmann et al. 2014)** a posterior matching event is conducted (Holzmann et al. 2014, p. 607). The assessment of this approach is shown in Figure 6-7 to visually identify how this approach differs from the representative assessment of the Database Search seen in Figure 6-6. For approach (12), requirement (3.1) is completely fulfilled.

However, both integration and absorptive competence are encouraged by these type of approaches, as they seek for specific technologies to integrate and use them in their internal

processes. Therefore, requirements (3.2) and (3.3) are partly satisfied (as it is actually never stated in the sources). About the last two fields, the lack of contact or previous knowledge of the candidates makes the approaches to not match these attributes. Again, Figure 6-7 shows the differences of the assessment of approach (12). Particular intermediaries from the firm can be identified in the approach, which fulfills requirement (3.5). Also, the approach looks specifically to establish a long-term relationship in the specific case study described, so requirement (3.4) is completely fulfilled.

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities	X			
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating			X	
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence	X(*)			
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project	X			
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

Figure 6-7: Assessment of approach (12) EEN Database search case study (Holzmann et al. 2012)

To conclude, the last set of requirements is fully satisfied by this type of approach. They generally offer a methodical guide for their appliance, which leads to completely fulfil requirement (4.1). Also, they look for either innovation or R&D partners. This leads to the fulfillment of requirement (4.2). Finally, as the output obtained is a small group of selected partners, requirement (4.3) is also fulfilled. However, this last requirement is only partly fulfilled because a proper ranking of the partners regarding their suitability is usually not given, but only the most suitable ones identified.

### 6.2.5 Pool-based Search Approach Assessment

Figure 6-8 shows the representative assessment for this type of search. For this type of approach, the two requirements from OI characteristics are generally partly satisfied. This is due to the fact that most of these approaches are based on evaluating a pool of partners through a set of criteria. These criteria evaluate the technical (1.1) and strategic (1.2)

relevance of the potential partners to the firm. They are only partly fulfilled because the depth of the evaluation through criteria is not ensured, as it depends on the specific approach.

However, approaches **(18) Cobranding partner pool-based search (Newmeyer et al. 2014)** and **(19) Cobranding pool-based partner selection (Prince & Davies 2002)** do not fulfill this first requirement. Their evaluation of potential partners only regards strategic aspects of a partnership.

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2 Not require the publication of internal information, to prevent knowledge drain	X(*)			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only		X		
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners		X		
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

Figure 6-8: Representative assessment for Pool-based Search Approaches

With regard of the second set of criteria, all the approaches ensure or take into account the potential partners’ motivation, so requirement **(2.1)** is always fulfilled. Also, the second requirement **(2.2)** is generally satisfied, by own assessment: if the approach does not explicitly involve interaction with the candidates, it is considered that it can be conducted internally by the firm. Exceptions are approaches **(22) Collaborative NPD partner evaluation (Emden et al. 2006)** and **(23) Criteria-Related Employability Assessment Method (Ripley 1994)**, since they involve interaction with external parties.

As established, the fulfilling of requirement **(2.3)** depends on the focus of the search approach. Among the approaches identified of this type, only **(16) Netnography (Belz, Baumbach 2010)**, **(17) Screening (Hippel 2006)** and **(21) Innovative capacity-based screening (Matthing et al. 2006)** are centered on users/ customers. Therefore they do not fulfill requirements **(2.3)** nor **(2.4)**.

Finally, requirement **(2.5)** is not generalized along the approaches of this cluster. For

approaches focused on customers as potential partners (approaches (16), (17) and (21)), this requirement is satisfied since the identified users will be Lead-Users (and they are expected to have radical innovative abilities). For the rest of them, the evaluation method of the pool of potential partners should ensure reviewing the technical skills in regard of radical innovation. However, the approaches found in this research do not ensure radical innovative capacities from potential partners. Therefore, this requirement will not be fulfilled in their individual assessments.

Turning to the third set of requirements, requirement **(3.1)** cannot be assessed, due to the lack of information about the interaction with the candidates. Approach (22) is an exception: it specifically states that the potential partners contact the focal firm (Emden et al. 2006, p. 334). Conversely, an absorptive **(3.2)** and integration **(3.3)** competence is present in the approaches. Requirement **(3.4)** is generally fulfilled by these approaches, as they evaluate in a lesser or greater extent the commitment of the partner for a long-term partnership. For example, approach (19) takes into account the commitment of the partner when evaluating it (Prince, Davies 2002, p. 53). Also approach (22) looks specifically for long-term partners (Emden et al. 2006, p. 337). Only approaches (16) and (21) do not take into account this factor.

Requirement **(3.5)** has been assessed as partly fulfilled for this type of search because it is fulfilled only in some cases/ approaches. The approaches that need interaction with the candidates are the ones that fulfill it completely. From the approaches found in this research, three of them require some interaction with the candidates, and the other five have none. Therefore, requirement **(3.5)** will not be fulfilled to these five approaches.

To conclude, this type of search satisfies the requirements for approach efficiency. Only approaches (16), (18) and (19) do not present a guideline on how to implement them. Therefore, requirement **(4.1)** is fulfilled but not in all cases. Moreover, all approaches except (23) (which focused on recruiting personnel) are specifically innovation-partner search approaches. Hence, requirement **(4.2)** is almost always satisfied either partly or completely. It is considered that approaches (18) and (19) partly fulfill this requirement as well: though they seek for a cobranding partner, it is interpreted that they aim to innovate through a cobranding arrangement. Finally, all approaches except (18) and (19) fulfill the last requirement **(4.3)**. These specific approaches only present an abstract guideline of partner attributes, while the rest of them deliver the results of the evaluation to compare the potential partners.

### 6.2.6 Algorithm-based Search Approach Assessment

In Figure 6-9 can be seen the representative evaluation of the algorithm-based type of search. The algorithm-based searches evaluate a set of criteria to assess the partners through a specific mathematical model. Therefore, their overview of technical and strategic skills depends on the criteria that are evaluated. Most of the approaches satisfy, at least partially, these requirements. Requirements (1.1) and (1.2) have to be evaluated for each particular approach.

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only		X		
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X(*)	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project	X			

Figure 6-9: Representative assessment for Algorithm-based Search Approaches

With regard to reducing the risks, the majority of these approaches do not take into account the motivations or interests of the potential partner, so requirement (2.1) cannot so far be assessed. Some specific approaches do mention to include an incentive policy, or discuss about the candidates’ interests. In those cases, this requirement is fulfilled.

Since most of the approaches can be conducted inside the company (without contacting the potential partners being evaluated) requirement (2.2) is generally satisfied. Requirements (2.3) and (2.4) depend on the focus of the approach. Most of the found approaches do not specify the kind of partner, and neither of them searches for customers. However, some of them focus in another type of partner, such as approaches (37) **Algorithm-based supplier search (Feng et al. 2011)** and (38) **Algorithm-based supplier selection (Toloo, Nalchigar 2011)**, which are selection methods for suppliers. Therefore, they do not meet requirement (2.4).

Requirement (2.5) is usually not assessable. For this cluster, it has been fulfilled when the

approach helps a company to establish an R&D alliance (it is expected that the main goal of an R&D alliance is to develop new products).

As for the third set of requirements, the disclosure competence **(3.1)** cannot be checked due to the lack of interaction with the candidates in most of the approaches. But requirements **(3.2)** and **(3.3)** are indeed partly satisfied. The approach normally does not take into account the control of the project **(3.4)**, so it has been considered that the method does not support the approach in this point. Only approach **(34) University-Industry algorithm-based search (Ning, Xue-wei 2006)** supports the company to look for a long-term arrangement. Furthermore, as these approaches are to be conducted within the company, there is no support for external communication. Hence, requirement **(3.5)** is generally not fulfilled.

Finally, two of the last three requirements are almost always satisfied. A methodical description **(4.1)** is normally ensured (given the nature of the approaches, all of them present a methodology to implement a mathematical model). Also, the output consists in targeting the most suitable partner out of the studied group. So requirements **(4.1)** and **(4.3)** are assured for these approaches. On the contrary, requirement **(4.2)** is not always fulfilled, since some of the methods seek for other type of partner. Examples of this are approach **(39) Criteria based ranking method (Afshari et al. 2010)**, which is an employee search approach; approaches **(37)** and **(38)** for suppliers; or approaches **(25) Partner selection with production-distribution planning (Su et al. 2015)** and **(26) Algorithm-based search for logistics' partners (Büyükoçkan et al. 2008)** for logistics' partners.

## 7 Implementation into Situative Open Innovation

The main goal of this thesis is to enlarge the pool of available search approaches suitable for being implemented into Open Innovation. More specifically, in step 2: “*Selecting OI partners*” in the *Situative Open Innovation* model, a guideline to successfully implement Open Innovation, ensuring the right participants and strategies (Gürtler & Lindemann 2013). A high variety of approaches offers different types of search, approaches with different target partners, different requirements, etc. Therefore, a firm can choose and perform the search approach that most suits its situation and OI-project. **But how can a company select the most suitable partner search approach for its OI-project?**

This section presents a brief introduction on how to use this pool of partner search approaches. In other words, it offers guidance through the selection of the approach using the profile presented in section 5. The profile includes different aspects of an approach to be described through textual explanation or highlighting the suitable options. These aspects have been purposely sorted to match the order that might be used to select an approach.

The first field to take into account is the **process phase** (the method description is not taken into account here due to its textual explanations). This is the most critical field, since the phase of the partner search determines the approaches that can be implemented. The next sub-section presents all the approaches found through this thesis classified according to the phases of *SOI-2: Selection of OI-partners*.

### 7.1 Classification of approaches by stages of SOI

One of the fields in the approach profile is **Process phase**. This field refers to the phase within the second step SOI (the selection of OI-actors) in which the profile can be implemented. Figure 7-1 represents a matrix with the different phases of *SOI-2*. On it, each approach horizontally covers the phases in which it can be implemented. Additionally, Figure 7-1 shows the classification of the approaches by their type of search on the left. This matrix enables an analysis of the approaches combining the type of search with the phase of the process.

Usually, **open, network-base, open call** and **database searches** are centered on the third phase: *search for new partners*. In other words, these types of search can seek for partners who were so far unknown. The **open search** is by definition to be implemented for the search of new potential partners. It normally has no previous requirements, so it can be used as a first search. Its outputs are rather generic (no specific actor identified). Hence, it leads to a posterior search approach to assess and rank the potential partners found (that is, to finally identify the suitable partner to start a collaboration). As can be seen in Figure 7-1, some of them are also useful to structure the current SH.

The **open call, network-based** and **database searches** are also to be implemented in this phase. With them, completely new potential partners can be found. Also, neither of them normally fulfills the whole partner search (from finding new potential partners to assessing

and ranking the candidates). Although, **database search** approaches can provide with a ranking or score of the potential partners. Among the found approaches, only one provides with a ranking of the candidates.

Instead, most of the **pool-based** and **algorithm-based** approaches focus on phases 4 and 5: the *assessment, ranking and selection of potential partners*. These types of search normally require a group of potential partners to assess and/or rank them. This group of potential partners can be chosen by some other approach, or some other criteria of selection (such as pre-selecting previous partners, or acquaintances made through networking). Normally, their output includes a ranking or an overall magnitude that allows a factual comparison between them.

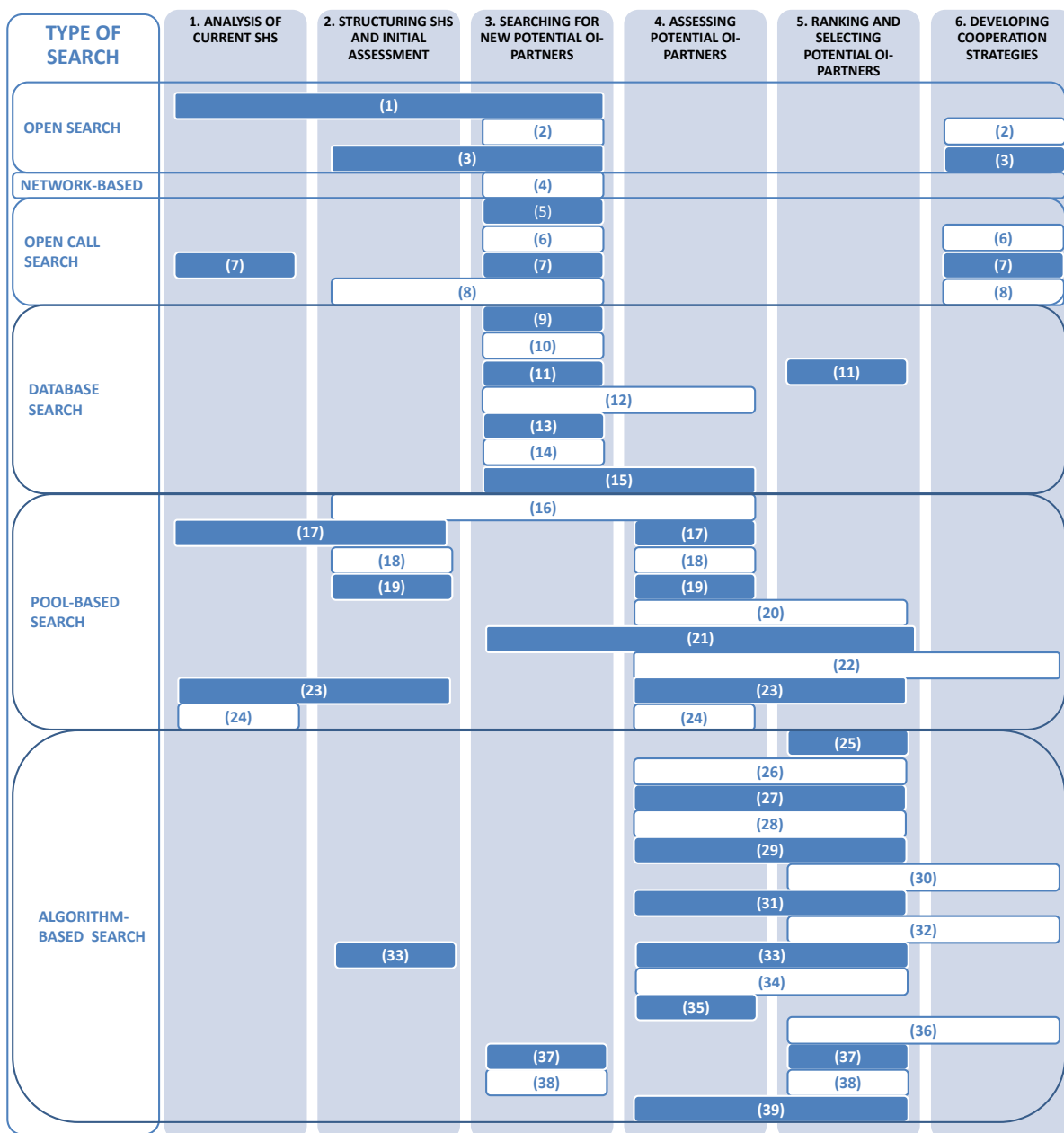


Figure 7-1: Partner search approaches vs. sub-steps of SOI-2 phase



With this, a brief overview of the types of search depending on the phase of the partner search has been given. A company implementing *SOI* can start the selection of the most convenient approach to use by choosing the phase(s) in the partner search. Once the phase is determined, the approaches are delimited. The next sub-section gives some guidelines to choose among these approaches delimited by the process phase.

## 7.2 Partner search approach selection

Apart from the implementation phase, an approach has to fit the situation and requirements of the company. Therefore, further criteria for the selection of an approach are needed. To that end, the fields in the profile can be used as criteria to select a suitable approach. Figure 7-2 shows a list of the fields enclosed in the profile. The formatting of the profile (different options to be highlighted in each field) allows filtering the approaches with desired characteristics.

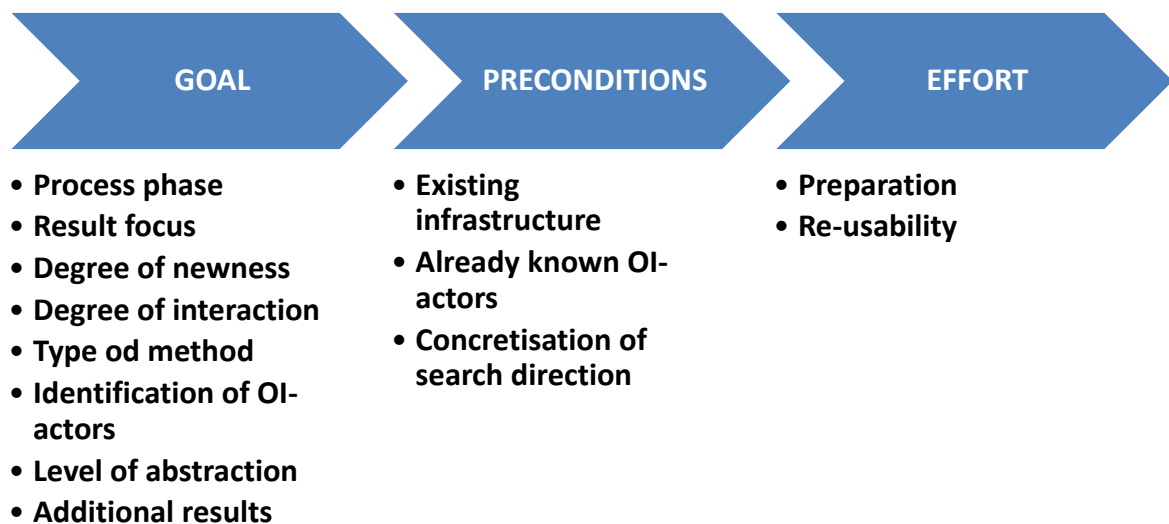


Figure 7-2: Fields in the approach profile

To filter the approaches, the firm has to state what fields are relevant to them. Therefore, the first step is to state the company's priorities with regard to the approach, using the profile as a tool. In this case, the fields in the profile will be analyzed from the point of view of the company. However, the different clusters of attributes have to be treated differently.

First, the fields in **goal** will be used to state the requirements from the company towards the desired approach. Figure 7-3 presents the guidelines to determine the relevant fields. For each attribute, a question is stated to see if the attribute is a requirement for the company. The questions, included in Figure 7-3, are as follow:

- **Process phase:** Does the company want to perform a search approach in a specific phase(s)?
- **Result focus:** Does the company seek specifically for either quality or quantity in the result of the search?
- **Degree of newness:** Does the company have any requirements with regard of the

- previous knowledge of the potential partners identified?
- **Degree of interaction:** Does the company have any requirements with regard of the interaction with the potential partners?
- **Type of method:** Does the company seek for a specific type of method?
- Identification of potential OI-actors: Does the company have any preference or requirement about who has to identify the potential partners?
- **Level of abstraction:** Does the company have any requirements on how the approach has to be described (abstract or specific guideline, description of a case, etc.)?
- **Additional results:** Does the company seek to obtain other results through the implementation of the approach besides the identification of potential partners?

PROCESS PHASE	Does the company want to perform a search approach in a specific phase(s)?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
RESULT FOCUS	Does the company seek specifically for either quality or quantity in the result of the search?	quality	quantity				
DEGREE OF NEWNESS	Does the company have any requirements with regard of the previous knowledge of the potential partners identified?	well known	vaguely known	completely unknown			
DEGREE OF INTERACTION	Does the company have any requirements with regard of the interaction with the potential partners?	none	useful	necessary			
TYPE OF METHOD	Does the company seek for a specific type of method?	open search	search within a pool of potential partners		assessment		
IDENTIFICATION OF POTENTIAL OI-ACTORS	Does the company have any preference or requirement about who has to identify the potential partners?	OI-project team	other actors	self-selection			
LEVEL OF ABSTRACTION	Does the company have any requirements on how the approach has to be described (abstract or specific guideline, description of a case, etc.)?	general overview	abstract guide	methodical guide	descriptive	implementation case	
ADDITIONAL RESULTS	Does the company seek to obtain other results through the implementation of the approach besides the identification of potential partners?	overview of topic	user needs	solutions			

Figure 7-3: Guidelines to identify relevant fields among the goal attributes in the profile

All of the questions are proposed so that a positive answer means the specific attribute is a relevant field for the company. In that case, the company has to select *what* are those requirements among the given options. This way, those fields will be used to select the approaches. However, the relevant fields can be distinguished between **required** and **desired attributes**:

- **Required** attributes are those necessary for the company. Therefore, they will be the ones used to first filter the pool of approaches. Only those with the required attributes will be considered.
- **Desired** attributes are the attributes the company prefers among the options given. Therefore, they will be used to decide among the approaches that match the required attributes.

Furthermore, the attributes in the preconditions and effort sections of the profile have to be used once the most suitable approaches have been identified. First, the **precondition** attributes are the requirements from the approach that the company must fulfill. Therefore, in order to implement the selected approach, the company has to be able to respond

positively to the three questions related to the three fields in this section:

- **Existing infrastructure/tools:** Does the company have the tools required by the approach, or is able to have access to them?
- **Already known OI-actors:** Does the company have access to the needed known actors?
- **Concretisation of the search direction:** Has the company a defined search direction as precisely as the search approach needs?

Finally, the **effort** section indicates the company how much effort will be needed to implement the approach, and if the approach results can be used in future searches. This way, the company can decide if that meets the effort they are willing to invest in the partner search.

## **8 Discussion of Results**

In this section, the benefits and limitations of this research will be briefly discussed. To that end, a short overview of the contributions of this thesis will be presented. However, the limitations of the research will be also argued.

### **8.1 Benefits**

The aim of this research was to enhance the current pool of methods to identify suitable partners for OI collaborations. This thesis presents the results of a systematic search through literature: different partner search approaches have been found to help a company identify the most suitable partners. This means, the results include different approaches regarding diverse types of partner. So far, no holistic overview of partner search approaches had been performed in the literature. In other words, this research brings together partner search approaches that belong to different disciplines, with the goal of adapting them to an OI-context.

Moreover, with the tool used to derive search terms, gaps in the current research and in the literature can be easily identified. This enables the possibility of enhancing the research to those steps of the innovation process where less approaches have been found so far, through different search terms or methods than the already used. Also, new partner search approaches might be developed for those fields in which partner search approaches are not so common. This way, stakeholders with valuable information could be reached.

Among the results, recurrent methods have been identified. This thesis provides with a classification of possible types of search. This classification is definitely useful in the topic, as no holistic overview has been found so far in the literature regarding search approaches. The thesis offers a list of the basic types of search regarding partner selection identified among the found approaches. For each type of search, a brief description is given. With this, also the possibilities of implementation of each type of search can be overviewed, e.g. if a type of search only can be used as a support tool or it is a holistic partner search.

Besides, an assessment method is proposed and implemented. Therefore, this research establishes a systematic way to analyze partner search approaches regarding their suitability to OI, including risk avoidance and support to the company. With it, any approach can be evaluated to see if it can be used to search for OI-partners, or if it is worth to adapt them into an OI-context.

Given the pool of partner search approaches found through this research, a company needs support on which one to use when conducting an OI-project. Therefore, some guidelines have been proposed regarding the selection of the most suitable approach. This selection system is based on analyzing the company's requirement and expectations towards a partner search approach. Then, it uses the approach profile to filter the approaches according to these expectations, and identifies those approaches that fit with the company.

## 8.2 Limitations

The main limitation of this research is that obviously it does not include all the existing approaches regarding generic partner search nor specific innovation partner search. This could be caused, on the one hand, by the choice of search terms. On the other hand, the literature about partner selection in Open Innovation is not vast, so generic partner searches have been included as well, even though these are not suitable to implement directly into *SOI*. This implies a posterior need to be adapted or modified to an Open Innovation context before actually be useful. However, enhancing the pool of partner search approaches here presented can be the scope for future research.

Another point of discussion in this thesis is the self-interpretation regarding some fields in the profiles or the assessment of approaches. In other words, some of the information is not extracted from explicit information in the source of the approach, but an interpretation was necessary. For instance, the field regarding the partner type within the profile has been fulfilled in the terms of the source of the approach. Also, the difference between the options in some fields is a bit diffuse. In 'Level of abstraction', if an approach is a general overview or an abstract guide is no objective rule. The difference between quality and quantity in 'Result focus' has been established during the research. However, it could be judged by other patterns from another point of view. Finally, the necessary 'Preparation' (low or high effort investment) is has been the most abstract evaluation to perform, even though the criteria to decide has been also specified. Therefore, it has to be considered that those fields are subjective to this thesis and not conclusive data.

Besides, in regard of the assessment table, the first consideration is that the importance of the established requirements, in particular the ones added in this research in comparison with the ones taken from Gürtler et al. (2013) have not been evaluated in industry, and maybe more critical requirements have not been included here. As well as for the approach profile, some of the requirements have been evaluated through a subjective point of view, for instance the requirements for reducing risks. Besides, they do not allow a partial fulfillment of the requirements (only categorical answers *yes/no*). This may have hindered the assessment of some unclear evaluations, and maybe minimized the interpretations made.

In regard with the implementation into *SOI*, assumptions have been made about what could be a firm's priorities. Thus, evaluating this part in industry was out of the reach of this research but would be highly contributing. Based on this, a specific strategy on selecting the right approach could be developed.

## 9 Conclusions

Open Innovation defends that valuable ideas can come from either inside or outside the company (Chesbrough 2006, p. 43). To reach out to this valuable knowledge, the OI-project has to be planned, and that includes identifying the OI-actors. The selection of the right OI-actor is highly decisive on the project's success, and is seen as both a benefit (gaining external solvers and knowledge until now not reachable) (Gürtler et al. 2014, p. 1027) and a concern by the industry when implementing OI (Gürtler et al. 2014, p. 1028). The partner selection is seen as a challenge because there is so far no methodical approach to select the most suitable partner to an OI-project. Gürtler & Lindemann (2013) present *Situative Open Innovation*: a methodical framework to support companies plan an OI-project. It aims to provide with a method to identify and select OI-partners, combining both strategic and technical perspectives. But, so far, only partial approaches have been found in the literature. Hence, the motivation for this research was to enlarge the number of current available partner search approaches.

To that end, this thesis takes a look into the literature to search for existing partner search approaches through different disciplines. To perform a **systematic search**, all the possible partners have been listed through the phases of the innovation process. This way, no important stakeholders are missed out of the search. The list of possible partners has been used as a tool with two purposes. On the one hand, search terms have been derived from the different stakeholders. These search terms have been tried in search engines (such as *Google Scholar*, *Web of Knowledge*, *Scopus*, etc.) to look for partner search approaches related to them. On the other hand, this list can be used as search documentation. This way, fields for future research can be identified. Before performing the search, a **requirement analysis** has been performed. It states the expected characteristics in a search approach.

A total of 39 search approaches have been found and presented through this thesis using the mentioned search methodology. All these approaches have been classified by two different criteria. First, the approaches are clustered by the **phases in the innovation process**. The results show that more approaches have been found in the literature for partners in the first stages of the process, e.g. Market research and Product development. They include approaches to select partners as universities, other firms in the field, patent owners, etc. Meanwhile, not so many partner search approaches have been found for the last phases of the process, e.g. Sales, After-sales and Disposal. Therefore, these phases enable further research fields for partner search approaches.

Moreover, recurrent characteristics have been recognized among the 39 approaches. Therefore, this thesis presents a categorization of the **types of search**. Six types of search have been identified, and are here described along with its methods and requirements. These characteristics are common among the approaches clustered in each of them.

To characterize the found approaches, an **approach profile** has been introduced. This profile is based on one proposed by Saucken (2015) and adapted by Gürtler (2015). It has been modified to better fit the purpose of this research. The profile consists of a table with different fields, which provide with a holistic overview of the approach. The fields are

distributed in four sections: **Method description**, which allows textual description; and **Goal, Preconditions** and **Effort**, which offer different options to highlight those who most fit the approach. This profile can be used for representing the approaches here found as well as for future findings. Hence, a pool of partner search approaches uniformly described can be obtained. Moreover, the profile has the function of supporting the selection of the most suitable partner search approach for a specific OI-project. The fields in the approach are sorted so that they reflect the order in which a company/OI-team might use them to select one of them.

To evaluate all the identified approaches, an **assessment methodology** has been developed and implemented. It is based on the requirements listed at the beginning of the research. The assessment of the approaches consists in evaluating whether the identified approaches fulfill the requirements. However, this thesis also presents a representative assessment for each type of search. They have been assessed through their distinctive characteristics. Therefore, this thesis presents not only a group of partner search approaches, but also an assessment regarding their suitability towards Open Innovation. Through this assessment, the suitability of the approaches to be used by *SOI* is studied. Some of them cannot be directly used, but an adaptation might be needed. This can be due to the fact that not all of them are specific for innovation partners.

The final purpose of this thesis was to **enhance the available partner search methods** to better implement *Situative Open Innovation*. To that end, this research has classified the approaches by the phase in the partner search in which they can be implemented. Furthermore, a strategy is presented to use the profile to **support the selection of an approach** for a specific OI-project. It helps the company identify their priorities and requirements towards a search approach. Then, the company can filter the search approaches that fit their requirements in order to find the most suitable one regarding their project.

In summary, this thesis provides with a search methodology to look for partner search approaches in the literature, a classification of types of search and an assessment method. The main result of the research is a pool of partner search approaches to be used in the partner search phase of *SOI*. Guidelines to select the most suitable partner search approach regarding an OI-project are also given. The managerial implications of these findings are a better conduction of the partner search in the *Situative Open Innovation* model. The availability of this pool of approaches enhances the resources a company has for applying OI with support of the needed guidelines.

However, the review of the search partner approaches is not complete. First, the partner list by the innovation process phases enables future research to keep finding for approaches in the fields where not so many approaches have been found so far. The fields in which there is a higher lack of approaches are the phases of Sales and Disposal. For the **Sales** phase, the approaches found so far are always focused on identifying Lead-Users. However, other stakeholders are related to this phase, e.g. retailers and marketing agencies. For the **Disposal** phase, no approaches have been found through this research. Therefore, it needs further investigation. The development of new partner search approaches is also possible.

Additionally, there are partner search approaches that are not to be used directly in an OI

context. Therefore, this enables another field for future research: the **adaptation of partner search approaches** from other disciplines and fields to Open Innovation.

Moreover, the findings in this research are mainly theoretical. Therefore, future research should focus on evaluating the significance of these findings in industry. Specifically, the selection method that has been developed to choose among the identified approaches has to be evaluated by industry, and improved if needed to better fit the industry needs and requirements.



## **10 Reflection of Research Design**

The approach for this research is detailed in section 2 of the thesis. First, a systematic way for reviewing the existing literature on the topic was created- the ‘partner structuring’ table. On the one hand, it cannot be ensured that all possible partners were included. On the other hand, a relative high effort was invested in this point, when it is merely a tool for the main body of the research. Instead, more effort should have been put in the actual use of the table, to derive search terms and properly search for partner search approaches. That would have maybe resulted in a higher number of approaches found or with better suitability for Open Innovation. Apart from that, the requirement list was stated before start looking for approaches. The original list extracted from (Gürtler et al. 2013) was modified by adding some requirements. In this point, more background research about significant requirements for OI-search approaches from the industry should have been made. Instead, some of them were added while finding approaches, and derived from them. The same could be said for the fields added to the profile used to characterize the approaches.

Finally, while conducting the research, a saving of effort would have been completing the profile of an approach and the assessment at the same time. This way, also a better assessment can be done, as completing the profile implies a fully understanding of said approach. Otherwise, the later performance of the evaluation can lead to uncertainties. However, as the requirement list was modified while conducting the search this would have been inefficient.



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## A1 Search Documentation

Source	Search terms	Results	Author, Year
Web of Science	"open innovation" "partner selection"	<i>A systematic approach of partner selection for open innovation</i>	Byungun 2014
		<i>Development of dual technology roadmap (TRM) for open innovation: Structure and typology</i>	Geum 2013
		<i>How to use patent information to search potential technology partners for Open Innovation</i>	Jeon 2011
Web of Science	"open innovation" "partner search"	-	
Web of Science	"open innovation" "suitable partner"	-	
Web of Science	partner identify* innovate*	<i>The effects of outsourcing strategies and outsourcing partner selection factors on the success of outsourcing and BSC performance</i>	Jeong 2011
Web of Science	partner select* strategy	<i>Integrated partner selection and production-distribution planning for manufacturing chains</i>	Su 2015
		<i>Partner selection in virtual enterprise under uncertain information about candidates</i>	Huang 2011
		<i>Optimisation of partner selection and collaborative transportation schedule</i>	Duy Dao 2014
		<i>Network position and cooperation partners selection strategies for research</i>	Liu 2015
		<i>Cobranging arrangements and partner selection</i>	Newmeyer 2014
Google Scholar	open innovation customers	<i>Innovation in the front line: structured approach to knowledge creation through OI with customers</i>	Grabowski 2010
		<i>Customer-Driven Innovation</i>	Desouza 2008
Web of Science	partner strategy innovate*	-	
Web of Science	partner selection strategy innovate*		
Web of Science	open innovation partner strategy	<i>A Study on the Modes of Open Innovation Matched With Firms' Internal Capabilities</i>	Chen 2014
		<i>Finding the right partners</i>	Bodas Freitas 2014
Google Scholar	"von hippel" 2006	<i>Efficient Identification of Leading-Edge Expertise: Screening vs. Pyramiding</i>	Von Hippel 2006
	-	<i>Selective search, sectoral patterns, and the impact on product innovation performance</i>	Köhler 2012
	-	<i>A method using two dimensions of the patent classification for measuring the technological proximity: an application in identifying a potential R&amp;D partner in biotechnology</i>	Angue 2014
Scopus	partner search innovation	-	
	open innovation supplier	-	
	supplier search innovate	-	
	"open innovation" worker	-	
Lit references in Byungun 2014		<i>Selection of the strategic alliance partner in logistics value chain</i>	Bueyuekoekzan 2008
		<i>The analytic network process for partner selection criteria in strategic alliances</i>	Wu 2009
		<i>Collaborating for new product development: selecting the partner with maximum potential to create value</i>	Emden 2006
	Same issue as previous article	<i>Finding Commercially Attractive User Innovations: A Test of Lead-User Theory</i>	Franke 2006
		<i>Optimizing the selection of partners in production networks</i>	Fischer 2004
		<i>Suppliers selection in the presence of both cardinal and ordinal data</i>	Saen 2007
		<i>Suppliers selection in volume discount environments in the presence of both cardinal and ordinal data</i>	Saen 2009



Source	Search terms	Results	Author, Year
		<i>A new DEA method for supplier selection in presence of both cardinal and ordinal data</i>	Toloo 2011
		<i>Cobrading arrangements and partner selection</i>	Newmeyer 2014
		<i>Optimisation of partner selection and collaborative transportation scheduling in Virtual Enterprises using GA</i>	Duy Dao 2014
Scholar	cobranding arrangements partner selection	<i>Co-branding partners: What do they see in each other?</i>	Prince 2002
Shcolar	"open innovation"	<i>Open Innovation: researching a new paradigm</i>	Chesborough 2006
		<i>OI: the new imperative from creating and profiting from technology</i>	Chesborough 2006
	community		
Web of Science	"openn innovation" alliance	<i>Development of dual technology roadmap (TRM) for open innovation: Structure and typology</i>	Geum 2013
Web of Science	R&D partner selection	<i>Friends, Acquaintances, or Strangers? Partner Selection in R&amp;D Alliances</i>	Li 2007
		<i>Partner Selection in Emerging and Developed Market Contexts: Resource-Based and Organizational Learning Perspectives</i>	Hitt 2000
		<i>Applying ANP approach to partner selection for strategic alliance</i>	Chen 2008
		<i>An analytic hierarchy process approach with linguistic variables for selection of an R&amp;D strategic alliance partner</i>	Chen 2010
		<i>Network-Independent Partner Selection and the Evolution of Innovation Networks</i>	Baum 2009
		<i>Partner Selection in R&amp;D Cooperation</i>	Atallah 2005
		<i>A method for partner selection of codevelopment alliances using individual and collaborative utilities</i>	Feng 2010
		<i>Partner selection for international strategic alliances in emerging economies</i>	Li 2008
Google Scholar	collaboration employee selection	<i>Partner selection for interfirm collaboration in ship design</i>	Solesvik 2010
		<i>Employee Involvement: Its Interaction With Advanced Manufacturing Technologies, Quality Management, and Inter-Firm Collaboration</i>	Bayo-Moriones 2004
Google Scholar	search employee innovation	<i>Motivating Creativity and Enhancing Innovation through Employee Suggestion System Technology</i>	Fairbank 2001
		<i>Multicultural Teams: Increasing Creativity and Innovation by Diversity</i>	Gassmann 2001
within the journal "creativity and innovation management"	partner selection	<i>Integrating Customers in Product Innovation</i>	Sandemeier 2010
		<i>The Influence of the Type of Relationship on the Generation of Innovations in Buyer-Supplier Collaborations</i>	Clauss 2012
Google Scholar	selection method innovation partner	<i>An extended TOPSIS method with interval-valued intuitionistic fuzzy numbers for virtual enterprise partner selection</i>	Ye 2010
		<i>Strategic venture partner selection for collaborative innovation in production systems: A decision support system-based approach</i>	Hacklin 2006
		<i>MAPSS, a Multi-Aspect Partner and Service Selection Method</i>	Paszkiwicz 2010
		<i>A decision method for supplier selection in multi-service outsourcing</i>	Feng 2011
		<i>University-Industry Alliance Partner Selection Method Based on ISM and ANP</i>	Ning 2006
		<i>Proposal of method for an automatic complementarities search between companies' R&amp;D</i>	Cordeiro 2014

Source	Search terms	Results	Author, Year
		<i>Co-creation in social media platforms: End-users as innovation partners: Online co-innovation within the open discovery space</i>	Vollenbroek 2013
		<i>In search of complementarity in innovation strategy: Internal R &amp; D and external knowledge acquisition</i>	Cassiman 2006
		<i>Social Media: A TOOL FOR OPEN INNOVATION.</i>	Mount 2014
Scopus	"open innovation" partner match*	<i>System for automatic entrepreneurial complementarity search through patents data bases</i>	Cordeiro 2010
		<i>Defining dimensions in expertise recommender systems for enhancing open collaborative innovation</i>	Nguyen 2014
		<i>Maximizing buyer-supplier relationships in the Digital Era: Concept and research agenda</i>	Obal 2013
Scopus	"open innovation" supplier partner	<i>Multi-source information fusion for open innovation decision support system</i>	Li 2013
		<i>Creating successful innovation partnerships</i>	Trailter 2009
	(supplied by M- Gürtler)	<i>Matching Partners for Open Innovation Practice</i>	Manotungvorapun 2015
Google Scholar	"employee selection" innovation	<i>Developing successful technology-based services: the issue of identifying and involving innovative users</i>	Matthing 2006
	(try to select the specific selection methods)	<i>Simple Additive Weighting approach to Personnel Selection problem</i>	Afshari 2010
		<i>CREAM: Criteria-Related Employability Assessment Method: A Systematic Model for Employee Selection</i>	Ripley 1994
		<i>Online recruiting and selection: Innovations in talent acquisition</i>	Reynold 2009
		<i>Electronic employee selection systems and methods</i>	Scarborough 2000
		<i>Employee selection via multiple neural networks</i>	Scarborough 2000
		<i>Hiring an innovative workforce: A necessary yet uniquely challenging endeavor</i>	Hunter 2012
Google Scholar	netnography	<i>Netnography as a metod for lead-user identification</i>	Belz and Bauchman 2010

## A2 Partner search approaches

### A2.1 Collaboration experience based open search (Li et al. 2008)

Method description	<b>Goal</b>	What is the specific goal of this method?	Determine whether it's better to collaborate with a previously known partner (Friend), a known firm with limited prior interaction (Acquaintance) or a completely new potential partner (Stranger).
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	R&D partner
	<b>Input</b>	What input (data, information) is needed to apply this method?	Three groups of partners: - those with whom the firm has already worked for a longer period - those with whom the firm has a weaker but existing relationship - and those with whom the firm has never interacted.
	<b>Output</b>	What output (data, information) does this method deliver?	The identified type of partner, so that the firm can search for a prospective partner within that group
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Define the partner groups and the intentions the focal firm has toward the alliance to be established
	<b>Limitations</b>	What limitations is the approach subject to?	Difference between Friends and Acquaintances is diffuse, not all the factors are considered. Also, the paper focuses on partner firms' ability to behave opportunistically while taking their willingness to perform such behaviors as a given. Last, the depletion of the knowledge stocks by partner firms is not considered.
	<b>Advantages</b>	What are specific advantages of this method?	The approach looks specifically to protect the focal firm assets
	<b>Disadvantages</b>	What are specific disadvantages of this method?	It only identifies the whole group of potential partners where to look for a prospective partner, so the approach is not very conclusive (*) The 'Stranger' category is too wide to be categorised, as it's not made clear how to choose among them.
	<b>Procedure</b>	What are the steps to conduct to perform this method?	Determine the firm's situation and needs to establish where to look for a partner to collaborate with (meaning if the search for a partner should screen the 'Friends', the 'Acquaintances' or the 'Strangers')
	<b>Other methods</b>	Are there any sub-methods used?	No other specific methods are used in this approach
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Li et al., 2007. <i>Friends, acquaintances, or strangers? Partner selection in R&amp;D alliances</i>
<b>Examples</b>	What are exemplary applications of the method?	No examples are exposed in the source	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.2 OI-partner-type based open search (Chen 2014)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	To achieve higher efficiency of openness by selecting suitable OI modes matched
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Any, it states what kind of partner should be searched/ selected
	<b>Input</b>	What input (data, information) is needed to apply this method?	Analysis of the internal capabilities of the firm
	<b>Output</b>	What output (data, information) does this method deliver?	Hypotheses about different types of firms and their potential best OI-partner. Also, proposal of collaboration for each type.
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	No further requirements than a self-assessment if the focal firm
	<b>Limitations</b>	What limitations is the approach subject to?	No direct partner obtained, but a general overview of the type of partner that a firm should look for.
	<b>Advantages</b>	What are specific advantages of this method?	Improvement of the innovation performance by a more efficient OI implementation.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Too general approach, cannot be used on its own (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Analyze internal capabilities and performance of the firm. 2. Derive the best possible type of partner for an OI-collaboration depending on results of step 1. Types of partner defined are stakeholders; universities and research institutes; competitors and intellectual property organizations.
	<b>Other methods</b>	Are there any sub-methods used?	None further methods are needed to perform this approach
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Chen 2014. <i>A study on the modes of Open Innovation matched with firms' internal capabilities</i>	
<b>Examples</b>	What are exemplary applications of the method?	Empirical analysis of different firms with respect to their OI status	

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity					N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation on case		N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions				N/A
	<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			
<b>Already known OI-actors</b>		Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors				N/A
<b>Concretisation of search direction</b>		How precise does the search direction need to be defined?	rough topic	precise terms	definition of task				N/A
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high					N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly				N/A

A2.3 Customer-type based open search (Desouza et al. 2008)

Method description	<b>Goal</b>	What is the specific goal of this method?	Classify and categorize customers to find the target community						
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Customers						
	<b>Input</b>	What input (data, information) is needed to apply this method?	Group of customers Customer data and information regarding specific features						
	<b>Output</b>	What output (data, information) does this method deliver?	Recommended target market and categorization of customers						
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Access to a group of customers						
	<b>Limitations</b>	What limitations is the approach subject to?	It's limited to clustering a whole community of customers						
	<b>Advantages</b>	What are specific advantages of this method?	Customer-driven innovation have more possibility of succes than the one <i>with</i> or <i>to</i> customers It proposes and encourages innovation driven by customers, actively involving them in the process						
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Does not take into account other points of view but the customer's (*) The approach is very imprecise about the selection of a proper OI-partner (*)						
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Relevant features definition 2. Classification and categorization of customers based on said features 3. Differentiation between "technology optimists", "technology investors" and "technology constrained"						
	<b>Other methods</b>	Are there any sub-methods used?	Methods to analyze high amounts of customer data.						
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Desouza et al., 2008. <i>Customer-Driven Innovation</i>							
<b>Examples</b>	What are exemplary applications of the method?	Multiple customer-driven innovations performed by diverse companies are described in (Desouza et al., 2008).							
Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A	
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A	
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A	
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A	
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A	
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A	
	Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
		<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
<b>Concretisation of search direction</b>		How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.4 Pyramiding (Hippel 2006)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	To find the most appropriate Lead-User in a field
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Users
	<b>Input</b>	What input (data, information) is needed to apply this method?	Field/ Topic of which we need to find the best expertise
	<b>Output</b>	What output (data, information) does this method deliver?	Community of users to be questioned
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Most known Lead-User, or the one with the best reputation in the field
	<b>Limitations</b>	What limitations is the approach subject to?	Access to a whole community of users
	<b>Advantages</b>	What are specific advantages of this method?	Its efficiency depends on the network density
	<b>Disadvantages</b>	What are specific disadvantages of this method?	People with a strong interest in a topic or a field tend to know someone with a larger expertise; it is possible for a researcher to incorporate learning acquired from previous experiments into each succeeding experiment in the series.
	<b>Procedure</b>	What are the steps to conduct to perform this method?	Dependant on the users view (capability of the final Lead-User is not objective, or need to be checked).
	<b>Other methods</b>	Are there any sub-methods used?	A number of experiments conducted in series: each experiment (consisting in Interviews/ questionnaires
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Efficient Identification of Leading-Edge Expertise: Screening vs. Pyramiding (Hippel 2006)
	<b>Examples</b>	What are exemplary applications of the method?	Case study conducted to compare screening and pyramiding efficiencies, reported in (Hippel 2006).

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case		N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions				N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.5 Broadcast search (Ili 2010)

Method description	<b>Goal</b>	What is the specific goal of this method?	Identify potential Lead-Users/ experts in a field					
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Consumers/ Users					
	<b>Input</b>	What input (data, information) is needed to apply this method?	Technology request					
	<b>Output</b>	What output (data, information) does this method deliver?	Self-selected potential partners Solution to the request published					
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Access to a web-platform					
	<b>Limitations</b>	What limitations is the approach subject to?	Only those users aware of the search will be identified					
	<b>Advantages</b>	What are specific advantages of this method?	No active search is needed Only those actors motivated to participate in the project will respond to the offer					
	<b>Disadvantages</b>	What are specific disadvantages of this method?	If a barrier is not set on the web-platform, anyone can make a proposal, producing maybe too many answers/candidates to the search					
	<b>Procedure</b>	What are the steps to conduct to perform this method?	Publishing some kind of advertisement/ bulletin and waiting for interested users/ experts to respond to it					
	<b>Other methods</b>	Are there any sub-methods used?	None mentioned					
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	(Ili 2010)					
<b>Examples</b>	What are exemplary applications of the method?	No examples are given in th source						
Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.6 Social media as an OI-tool (Mount, Martinez 2014)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	Examine social-media driven innovation in the three stages: ideation, R&D and commercialization.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Customers, users
	<b>Input</b>	What input (data, information) is needed to apply this method?	Specific task or field in which the company wants to innovate or get new feedback.
	<b>Output</b>	What output (data, information) does this method deliver?	Customers with innovative abilities are identified, and specific methods to implementing Open Innovation or to gain information are obtained
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Profile or site in a social media platform, as well as enough capability and resources to properly manage the website and the data collected
	<b>Limitations</b>	What limitations is the approach subject to?	Not many previous literature about this topic. A closed organizational and risk-averse culture, hierarchical structure, and large size can block the multiple benefits for this approach.
	<b>Advantages</b>	What are specific advantages of this method?	The direct involving of the consumer in the process helps create deep emotional bonds with the company, enhancing loyalty and satisfaction towards the brand. Same actors can be encouraged to evaluate other's ideas, making the best ones to emerge. This can also make 'lead-users' to naturally outstand. The speed and quality of ideas is improved. It enables both radical and incremental innovation. It is a cheaper and more effective mean for R&D than traditional methods.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	The post-processing of generated new ideas can be a problem if too many users decided to participate, requiring a high time and effort investment in reviewing all ideas and identifying the usable ones. Unuseful contributions cannot be avoided, as the platform is normally wide open to the public. Lack of regulation and centralized control over external social media platforms can emerge as a challenge when control was required for limiting the content generated and contributions to a specific target audience.
	<b>Procedure</b>	What are the steps to conduct to perform this method?	Specific procedures described in (Mount and Garcia, 2014)
	<b>Other methods</b>	Are there any sub-methods used?	Profile or site in a social media platform, as well as enough capability and resources to properly manage the website and the data collected.
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Mount and García, 2014. <i>Social media: a tool for Open Innovation?</i>
<b>Examples</b>	What are exemplary applications of the method?	Multiple case studies are described in (Mount and Garcia, 2012).	

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case		N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions				N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	



A2.7 Suggestion system based open-call search (Fairbank, Williams 2001)

Method description	<b>Goal</b>	What is the specific goal of this method?	Motivating employees to participate in a suggestion system.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Employees
	<b>Input</b>	What input (data, information) is needed to apply this method?	Tasks or fields where the firm wants to obtain new ideas or viewpoints
	<b>Output</b>	What output (data, information) does this method deliver?	Employees capable of supplying 'innovation' to the firm, and their ideas
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Common platform where the innovation-responses can approach the employees (*)
	<b>Limitations</b>	What limitations is the approach subject to?	The reach of this approach will depend on the number of employees of the firm (*)
	<b>Advantages</b>	What are specific advantages of this method?	Can be implemented in almost any organization. Innovations are obtained through people who would otherwise not be involved in the innovation process, and therefore their ideas would not be used.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Only approaches employees within the firm, its a closed search for partners. (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	Implementing a suggestion system technology based on expectancy theory: enhancing expectancy, instrumentality and valence in a methodical way (further explained in (Fairbank and Williams, 2001)), to link individual motivation to organizational innovations.
	<b>Other methods</b>	Are there any sub-methods used?	No specific further methods are used apart from the suggestion methods themselves
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Fairbank and Williams, 2001. <i>Motivating creativity and enhancing innovation through employee suggestion system technology</i>	
<b>Examples</b>	What are exemplary applications of the method?	No extensive case is explained on the source.	

		Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies																												
								quality	quantity	well known	vaguely known	completely unknown	none	useful	necessary	open search	search within a pool of potential partners	assessment	OI-project team	other actors	self-selection	general overview	abstract guide	methodical guide	descriptive	implementation on case	overview of topic	user needs	solutions	none	community	web-platform	none	single OI-actors	groups of OI-actors
Goal	<b>Process phase</b>	In which phase is the approach to be implemented?																																	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?					N/A																												
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?					N/A																												
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?					N/A																												
	<b>Type of method</b>	What is the type of the method?					N/A																												
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?					N/A																												
	<b>Level of abstraction</b>	How specific is the method description?					N/A																												
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?					N/A																												
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?					N/A																												
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?					N/A																												
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?					N/A																												
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?					N/A																												

A2.8 Marketplaces: platforms for open call partner-search (Nguyen et al. 2014)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	Finding an innovation partner through marketplaces (web-platform/communities)
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Technical partner/ Any individual willing to contribute with an idea/ solution to a specific problem
	<b>Input</b>	What input (data, information) is needed to apply this method?	Specific description of the task to be solved, and requirements to be satisfied by the seeker solver
	<b>Output</b>	What output (data, information) does this method deliver?	Solver(s) that answered to the challenge
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Reward to the used solutions/innovations
	<b>Limitations</b>	What limitations is the approach subject to?	The seek is only able to reach those solvers who review the specific platform.
	<b>Advantages</b>	What are specific advantages of this method?	Reduction of costs of partner identification and innovation lead time for the seeker, and increase of the community of participants for the intermediary while growing their revenue stream
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Requirements for a desired solver can only be expressed when matching the options offered by the ER system (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. The seeker firm posts a challenge (with the detailed problem, deadline and offered reward) that it's broadcasted to a diverse intellectual background of solvers. 2. Solvers review the challenge and decide to develop (or not) a solution. 3. Solvers select the challenge they want to attempt and agree to transfer intellectual property to the seeker. 4. The solvers obtain a room where to meet with the seeker. 5. The seeker's firm selects and rewards the winner. When using ER systems, the software itself proposes a solver(s) within the pool that meets the requirements established by the seeker. Afterwards the seeker gets in touch with said solver (if he considers him suitable)
	<b>Other methods</b>	Are there any sub-methods used?	Expert recommender (ER) systems.
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Nguyen 2014. <i>Defining Dimensions in Expertise Recommender Systems for Enhancing Open Collaborative Innovation</i>	
<b>Examples</b>	What are exemplary applications of the method?	InnoCentive website	

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case		N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions				N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.9 Technological-complementarity based patent database search (Byungun Yoon, Bomi Song 2014)

Method description	<b>Goal</b>	What is the specific goal of this method?	To search candidates for OI-partners and evaluate their capabilities
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Knowledge source
	<b>Input</b>	What input (data, information) is needed to apply this method?	Needed technology
	<b>Output</b>	What output (data, information) does this method deliver?	Set of potential partners for technological collaboration
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Accessible patent database
	<b>Limitations</b>	What limitations is the approach subject to?	Not all inventions are patented, so the firm should first identify the areas in which the approach has more validity. The process in which keywords are extracted and utilized to define the morphology matrix of a technology needs to be enhanced to demonstrate that the derived keywords are correct attributes capable of characterizing the collected patents.
	<b>Advantages</b>	What are specific advantages of this method?	Patents are public documents, they can be easily accessed through public and commercial databases (Yoon and Park, 2005). Patent documents are considered the most effective data to investigate innovation activities. It overcomes the limitations of approaches only focused on the insights and strategic decisions of the firm.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	The method only approaches the technological similarities between firms, not taking into account non-technological aspects (such as size, goal complementarity, etc.). (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Data collection and pre-processing 2. Discovery of technology opportunities 3. Identification of need technologies 4. Exploration of potential partners
	<b>Other methods</b>	Are there any sub-methods used?	GTM (Generative Tool Map); MA (Morphological Analysis)
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Yoon and Song, 2014. <i>A systematic approach of partner selection for OI</i>	
<b>Examples</b>	What are exemplary applications of the method?	Case study: thermal management (TM) technology of light emitting diodes (LEDs); in (Yoon and Song, 2014)	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case		N/A
Preconditions	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A	
	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A	
Effort	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.10 University-Industry matching system through patent database search (Yamada et al. 2013)

Method description	<b>Goal</b>	What is the specific goal of this method?	Match companies with researchers of universities and vice versa
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Knowledge source
	<b>Input</b>	What input (data, information) is needed to apply this method?	Query with which the software will look for matches through the database
	<b>Output</b>	What output (data, information) does this method deliver?	List of authors for a query and each characteristic word
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Specific software/system used Patent databases, published scientific papers.
	<b>Limitations</b>	What limitations is the approach subject to?	The system has issues with finding matches between companies and researchers due to the fact that its information retrieval system for patents and papers is too simple.
	<b>Advantages</b>	What are specific advantages of this method?	Matching between companies and researchers without the need of reading all the published papers and patents. It also has a version of the system for researchers who look for a company to collaborate with
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Specifications of the software used are not properly detailed in the mentioned source, even though the working principle is clear. (*) The output is a set of potential candidates with whom to collaborate but there is no further criteria to assess nor evaluate them as partners. (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. A query is introduced into the system 2. The system looks through the patent and/or papers database for a match, and examines the technologies of their companies. 3. The system extracts a set of characteristic words with related authors and companies.
	<b>Other methods</b>	Are there any sub-methods used?	Text mining
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Yamada et al., 2013. <i>Proposal of a matching system for companies and researchers using patents and scientific papers</i>
<b>Examples</b>	What are exemplary applications of the method?	Not mentioned in the source	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners	assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.11 Technology-need based patent database search (Jeon et al. 2011)

Method description	<b>Goal</b>	What is the specific goal of this method?	Search for potential technology partners as a supporting tool for OI					
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Technology partners					
	<b>Input</b>	What input (data, information) is needed to apply this method?	Desired technology to find a match					
	<b>Output</b>	What output (data, information) does this method deliver?	Top n potential technology partners sorted by a similarity factor					
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Access to a patent database					
	<b>Limitations</b>	What limitations is the approach subject to?	Not all inventions are patented, so the approach only reaches to the technology associated to a patent.					
	<b>Advantages</b>	What are specific advantages of this method?	Patents are public data and easily accessed. It facilitates a systematic and rapid search for partners. The method can be applied to various fields that need a technology search					
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Results depend highly on the choice of search terms					
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Data collection and pre-processing 2. Construction of co-occurrence vectors 3. Examination of the possibility of technology partners					
	<b>Other methods</b>	Are there any sub-methods used?	Co-occurrence vectors					
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Jeon et al., 2011. <i>How to use patent information to search potential partners in OI</i>						
<b>Examples</b>	What are exemplary applications of the method?	Case study using technology needs of yet2.com						
Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.12 EEN Database search case study (Holzmann et al. 2014)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	Search for innovative entrepreneurial partners for building new ties in innovation networks outside their stable supplier network.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Partners for collaborative innovation, anyone who can contribute with a technical solution
	<b>Input</b>	What input (data, information) is needed to apply this method?	Defined task for which the firm wants an OI-partner
	<b>Limitations</b>	What limitations is the approach subject to?	None specified in the mentioned source
	<b>Advantages</b>	What are specific advantages of this method?	Combines the results of the technology request with the criteria established by the manager, so the resulting potential partners are not a lot, but better chosen. It coordinates the party demanding innovation services, the party supplying innovation services, and the innovation intermediary
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Gap in the matching process, more managerial support asked High amount of time invested
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Define search criteria 2. Publish a technology request in a database and actively look for partners 3. Pre-select candidates according to requirements 4. Matching event
	<b>Other methods</b>	Are there any sub-methods used?	None
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Holzmann et al., 2014. <i>Matchmaking as a multi-sided market for OI</i>
	<b>Examples</b>	What are exemplary applications of the method?	Case Study 1: Process innovation in the production line ( <i>BMW</i> ) in (Holzmann et al., 2014)

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-factors?	overview of topic	user needs	solutions			N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.13 Technological-proximity based patent database search (Angue et al. 2014)

Method description	<b>Goal</b>	What is the specific goal of this method?	To check if two companies' knowledge bases "fit" in order for joint learning and innovation to be possible, and could therefore create an alliance
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	R&D partner
	<b>Input</b>	What input (data, information) is needed to apply this method?	Position of each firm in the created 'knowledge space'
	<b>Output</b>	What output (data, information) does this method deliver?	Value representing a distance in the knowledge space, which has to be interpreted together with the boundaries established.
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Solving software needed if it wants to be implemented on a higher scale (many candidates at a time)
	<b>Limitations</b>	What limitations is the approach subject to?	No specifications limit the application of this approach
	<b>Advantages</b>	What are specific advantages of this method?	The approach tries to ensure that firms reach to distant information (more valuable when it comes down to innovation) or access to trustworthy partners. Does not require complete information about the knowledge portfolios of other partners, but only assumes that firms can detect whether or not they are within some range of each other in the knowledge space. Effort investment to solve the mode is not very high (*)
	<b>Disadvantages</b>	What are specific disadvantages of this method?	It is a mathematical, and thus methodical, method, but lacks of instructions on how to apply it (for instance, what information is needed)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	The simulation model measures the created magnitude of 'knowledge distance'
	<b>Other methods</b>	Are there any sub-methods used?	Specific mathematical model described (not complex)
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Baum et al., 2009. <i>Network-Independent Partner Selection and the Evolution of Innovation Networks</i>
<b>Examples</b>	What are exemplary applications of the method?	A simulation is performed in (Baum et al., 2009) with a multiple-firm network to study the evolution over time of their alliances.	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case		N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions				N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.14 Technology-recurrence based patent database search (Cordeiro et al. 2014)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	Seek for matching between firms' R&D, and with doing so, reduce R&D costs while keeping firms competitive.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Research partner
	<b>Input</b>	What input (data, information) is needed to apply this method?	Patents published by a large set of firms (who are candidates for a partnership).
	<b>Output</b>	What output (data, information) does this method deliver?	Table showing all the technologies related to the one from the focal firm, and their frequency of occurrence
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	The company aiming to conduct this method to search for partners (referred to as RC, Reference Company) should be a high-technology developer firm, with a medium size patent portfolio (20 to 50)
	<b>Limitations</b>	What limitations is the approach subject to?	The search is limited to those patents who hold the same IPC as the typical RC's IPC, so there's no enhancing of the research fields. To do that, downloading the whole patent portfolio for each PCP would be necessary. The method only gathers R&D characteristics about the firm, not taking into account further features about the company, that will have to be studied later (such as economical power, size, location...).
	<b>Advantages</b>	What are specific advantages of this method?	Patents offer rich information about S&T activities into a worldwide geographical coverage. The information inside these documents is very reliable and structured. Both patent access and the Weka software are of free use
	<b>Disadvantages</b>	What are specific disadvantages of this method?	The results obtained show the technologies already related to the given technology, so this may not boost the radical innovative ideas. (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Choose de candidates to meet the requirements 2. Look into the portfolio for the most typical technology (IPC) of the firm 3. Search for all the PCP (Possible Companies for Partnership) in the database, using the most typical IPC as search term 4. Depict the obtained patents and companies within vectors 5. Reduce the dimensionality of vectors and run the Weka software to obtain a table of potential technological interdependence 6. Examine which of the technologies in the table are held by the RC, and derive possible partnerships
	<b>Other methods</b>	Are there any sub-methods used?	Knowledge Discovery in Databases (KDD) process, also known as Data Mining (DM) techniques; International Patent Classification (IPC): Weka software;
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Cordeiro et al., 2010. <i>System for Automatic Entrepreneurial Complementarity Search through Patents Data Bases</i>
<b>Examples</b>	What are exemplary applications of the method?	Described in (Cordeiro et al., 2010), a medium size American telecommunications supplier of network elements seeks for a research partner applying this approach	

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case		N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions				N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	



A2.15 Knowledge distance based patent database search (Baum et al. 2010)

Method description	<b>Goal</b>	What is the specific goal of this method?	To check if two companies' knowledge bases "fit" in order for joint learning and innovation to be possible, and could therefore create an alliance
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	R&D partner
	<b>Input</b>	What input (data, information) is needed to apply this method?	Position of each firm in the created 'knowledge space'
	<b>Output</b>	What output (data, information) does this method deliver?	Value representing a distance in the knowledge space, which has to be interpreted together with the boundaries established.
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Solving software needed if it wants to be implemented on a higher scale (many candidates at a time)
	<b>Limitations</b>	What limitations is the approach subject to?	No specifications limit the application of this approach
	<b>Advantages</b>	What are specific advantages of this method?	The approach tries to ensure that firms reach to distant information (more valuable when it comes down to innovation) or access to trustworthy partners. Does not require complete information about the knowledge portfolios of other partners, but only assumes that firms can detect whether or not they are within some range of each other in the knowledge space. Effort investment to solve the mode is not very high (*)
	<b>Disadvantages</b>	What are specific disadvantages of this method?	It is a mathematical, and thus methodical, method, but lacks of instructions on how to apply it (for instance, what information is needed)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	The simulation model measures the created magnitude of 'knowledge distance'
	<b>Other methods</b>	Are there any sub-methods used?	Specific mathematical model described (not complex)
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Baum et al., 2009. <i>Network-Independent Partner Selection and the Evolution of Innovation Networks</i>
<b>Examples</b>	What are exemplary applications of the method?	A simulation is performed in (Baum et al., 2009) with a multiple-firm network to study the evolution over time of their alliances.	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation on case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.16 Netnography (Belz, Baumbach 2010)

Method description	<b>Goal</b>	What is the specific goal of this method?	Analyze online communities to identify Lead-Users
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Consumers/Users
	<b>Input</b>	What input (data, information) is needed to apply this method?	Online community
	<b>Output</b>	What output (data, information) does this method deliver?	Users from an online community who match the defined attributes of a Lead-User (ahead of trend, dissatisfaction, product related knowledge, use experience, involvement and opinion leadership)
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Access to an online community Software programmes to analyse obtained data
	<b>Limitations</b>	What limitations is the approach subject to?	Researchers only analyse the content of a community's communicative acts rather than the complete set of observed acts of consumers in real life. Focusing on the most active members of the community may lead to missing out some Lead-Users among those who participate less, but analysing the whole community implies more effort and time.
	<b>Advantages</b>	What are specific advantages of this method?	Relies on external assessment instead of self-assessment. Uses publicly available information in online communities to analyse consumer needs, trends, behaviour and influences. Relatively high sample efficiency involving considerably low search costs.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Normally a further target screening is necessary to check the characteristics of identified Lead-Users. High effort investment required to analyze the massive amount of interventions from users. (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Making cultural entrée 2. Collecting and analysing data 3. Ensuring trustworthy interpretation 4. Following research ethics and providing opportunities for member feedback 5. If needed, conducting target screening among those identified potential Lead-Users
	<b>Other methods</b>	Are there any sub-methods used?	Data analysis methods through specific software; Target screening
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	(Belz and Baumbach, 2010). <i>Netnography as a method of Lead User identification</i>
<b>Examples</b>	What are exemplary applications of the method?	Case study explained in (Belz and Baumbach, 2010), in which the online community of <i>Utopia</i> is chosen to be analyzed.	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.17 Screening (Hippel 2006)

Method description	<b>Goal</b>	What is the specific goal of this method?	Select the most appropriate users
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Users
	<b>Input</b>	What input (data, information) is needed to apply this method?	Field/ Topic in which we want to identify a Lead-User Group of candidates to be interviewed
	<b>Output</b>	What output (data, information) does this method deliver?	Lead-Users in the field
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Group of candidates to be interviewed
	<b>Limitations</b>	What limitations is the approach subject to?	Dependant on the self-opinion of users
	<b>Advantages</b>	What are specific advantages of this method?	No dependence on the experiment/ questionnaire's results to continue with them Individual questionnaires can be conducted in parallel to save time.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	No learning is possible between experiments; higher time and money investment necessary (than e. g. for pyramiding). "Low sample efficiency, high search costs [...]and the reliance on the self-assessment of respondents can be misleading" (Belz and Baumbauch, 2010)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	Applying a screening questionnaire to a group of people/ potential partners regarding user innovation and lead-user characteristics, and select those who seem to be Lead-Users
	<b>Other methods</b>	Are there any sub-methods used?	Interviews, questionnaires.
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	(von Hippel et al. 2006)	
<b>Examples</b>	What are exemplary applications of the method?	Case study in (von Hippel et al., 2006) comparing <i>Screening</i> vs. <i>Pyramiding</i> .	

		Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
								quality
Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	well known	vaguely known	completely unknown		N/A	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	none	useful	necessary		N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	open search	search within a pool of potential partners			N/A	
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	OI-project team	other actors	self-selection		N/A	
	<b>Type of method</b>	What is the type of the method?	general overview	abstract guide	methodical guide	descriptive	implementati on case	N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	overview of topic	user needs	solutions			N/A
	<b>Level of abstraction</b>	How specific is the method description?	none	community	web-platform			N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	none	single OI-actors	groups of OI-actors			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	rough topic	precise terms	definition of task		N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	low	high			N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	no	yes, adapted	yes, directly		N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?					N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?					N/A	

A2.18 Cobranding partner pool-based search guidelines (Newmeyer et al. 2014)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	Provide cobranding guidelines to complement other factors, and eventually identify a brand with whom to collaborate
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Other brands/firms
	<b>Input</b>	What input (data, information) is needed to apply this method?	Other brands or firms to be evaluated as possible partners
	<b>Output</b>	What output (data, information) does this method deliver?	Brand evaluation and consideration map onto the strategic goals of brand
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	No specific requirements to conduct this approach
	<b>Limitations</b>	What limitations is the approach subject to?	It considers the effects of integration, exclusivity and duration, but not their interaction
	<b>Advantages</b>	What are specific advantages of this method?	It provides a mechanism of attribution to clarify when or how cobranding arrangements might work It offers an in-depth distinction of various strategic alliance concepts
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Supply-side factors (related to economics and production) are beyond the reach of the approach, so only strategic concepts are evaluated
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Evaluation of the focal brand (the one considering to forge an alliance) 2. Categorization of potential partners/brands, and then its evaluation through three main characteristics: - functional complementarity - hedonic consistency - brand breadth 3. Together with other factors, selection of the brand with whom to cobrand, and latter evaluation of the focal brand after the cobranding
	<b>Other methods</b>	Are there any sub-methods used?	None
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Newmeyer et al., 2014. <i>Cobranding arrangements and partner selection</i>	
<b>Examples</b>	What are exemplary applications of the method?	Several brands are studied and commented in (Newmeyer et al., 2014)	

		Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
		<b>Process phase</b>	In which phase is the approach to be implemented?	quality	quantity		
<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	well known	vaguely known	completely unknown			N/A
<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	none	useful	necessary			N/A
<b>Degree of interaction</b>	Does the method require an interaction with external actors?	open search	search within a pool of potential partners	assessment			N/A
<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation on case	N/A
<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform		N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors		N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task		N/A
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high			N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly		N/A

A2.19 Cobranding partner pool-based selection (Prince, Davies 2002)

Method description	<b>Goal</b>	What is the specific goal of this method?	Screening potential cobranding partners
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Other firms
	<b>Input</b>	What input (data, information) is needed to apply this method?	Selected potential cobranding partners
	<b>Output</b>	What output (data, information) does this method deliver?	Fitness of a potential partner in regard of establishing a cooperation strategy
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	No specific requirements are set to conduct this approach, it is a tool to perform a screening among different candidates (the set of pre-selected candidates will be needed in order to evaluate them)
	<b>Limitations</b>	What limitations is the approach subject to?	The defined criteria are mostly conceived to evaluate a brand/firm, so they are not (directly) applicable to other types of partner (customers, suppliers,...). It would be necessary to check the suitability of its adaptation
	<b>Advantages</b>	What are specific advantages of this method?	The criteria offer a holistic study of the strategic position of the candidates, covering aspects from compatibility to commitment.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	The defined criteria focus mainly on a strategic point of view, so it cannot be used on its own
	<b>Procedure</b>	What are the steps to conduct to perform this method?	Select candidates within brands/ firms with a related target audience, and analyze them, by following criteria: compatibility between brands; market volatility; investment requirement and arrangements; prospective partner's commitment to the agreement. The courtship between the brands consists in: 1. Assess opportunities 2. Set objectives 3. Develop strategies 4. Initiate relationships
	<b>Other methods</b>	Are there any sub-methods used?	None
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Prince and Davies, 2002. <i>Co-branding partners: What do they see in each other?</i>	
<b>Examples</b>	What are exemplary applications of the method?	Many cobranding alliances are superficially named in the mentioned source, but no implementation of the approach is performed	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A	
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A	
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A	
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A	
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A	
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A	
	Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
		<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
<b>Concretisation of search direction</b>		How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.20 OI-quality match pool-based search (Manotuvgorapun 2015)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	Assessing the matching quality of candidate partners who wish to engage in an open innovation project
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Any type of partner
	<b>Input</b>	What input (data, information) is needed to apply this method?	Criteria, if the given ones are not used Pool of partners
	<b>Output</b>	What output (data, information) does this method deliver?	Radar chart of studied prospective partners showing the criteria scores related to the expected values.
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Pool of pre-selected potential partners Software or tool to generate, display and compare the charts
	<b>Limitations</b>	What limitations is the approach subject to?	This approach has no specific limitation of implementation, because as mentioned in the source, the criteria have been specially enhanced to make it applicable to all kinds of partners
	<b>Advantages</b>	What are specific advantages of this method?	Global approach to assess all potential partners. It covers criteria in both technological and non-technological aspects: technological, strategic and relational alignments. Display of results (radar chart) is very user-friendly, easy to interpret
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Decision-makers are the ones who evaluate the aspects of each partner, so the final matching quality score will depend on their point of view
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Design an assessment model (proposal or a set of criteria) and state the requirements of a prospective partner (with regard of the criteria). 2. Compute matched quality of prospective partners. A radar chart is obtained showing the evaluation of the potential partner compared with the expected criteria scores. 3. Provide feedback to decision-makers: chart reported to managers, to use it as a decision facilitator, with options of <i>accept</i> , <i>pending</i> or <i>reject</i> (depending on the criteria scores).
	<b>Other methods</b>	Are there any sub-methods used?	Radar chart comparison
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Manotungvorapun and Gerdstri, 2015. <i>Matching Partners for Open Innovation Practice</i>	
<b>Examples</b>	What are exemplary applications of the method?	No examples are described in the source	

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners	assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.21 Innovative capacity-based screening (Matthing et al. 2006)

Method description	<b>Goal</b>	What is the specific goal of this method?	Identification of innovative customers and study the effectiveness of employing such customers to generate new service ideas in a technology-based service setting
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Customers/Users
	<b>Input</b>	What input (data, information) is needed to apply this method?	Group of customers
	<b>Output</b>	What output (data, information) does this method deliver?	Table with interviewed customers and their TRI indicating their innovative probabilities
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Group of customers Personal interview with each of the studied customers
	<b>Limitations</b>	What limitations is the approach subject to?	The samples used to conduct the experiments to prove the presented hypothesis are rather small.
	<b>Advantages</b>	What are specific advantages of this method?	Involving customers entails a deeper understanding of their needs, and enhances the probabilities of new ideas to match those needs. TR is a good predictor of customers' propensity to use new technology-based services, find solutions and participate in their development. Therefore can be a useful tool to identify lead-users
	<b>Disadvantages</b>	What are specific disadvantages of this method?	For the screening to be forceful, the amount of interviewed customers has to be considerably high
	<b>Procedure</b>	What are the steps to conduct to perform this method?	Conduct a 36-item TR scale questionnaire with a sample of customers, and classify them into the 5 segments presented by Parasuraman and Colby's, (2001). The paper proves that those who obtain a higher TRI have not only innovative attitudes and willingness to participate in developing new technologies, but are also capable of producing new service ideas.
	<b>Other methods</b>	Are there any sub-methods used?	Technology Readiness Index (TRI).
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Matthing et al., 2006. <i>Developing successful technology-based services: the issue of identifying and involving innovative users</i>	
<b>Examples</b>	What are exemplary applications of the method?	(Matthing et al., 2006) describes how the approach was proved on a sample of	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A	
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A	
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A	
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A	
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation on case	N/A	
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A	
	Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
		<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
<b>Concretisation of search direction</b>		How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.22 Collaborative NPD partner evaluation (Emden et al. 2006)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	Partner selection for collaborative NPD alliances using a theory development approach.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Company to form a codevelopment alliance
	<b>Input</b>	What input (data, information) is needed to apply this method?	Group of candidate companies
	<b>Output</b>	What output (data, information) does this method deliver?	Partner with maximum potential for creating technological synergy, with maximum potential to collaborate and with a maximum potential to sustain the relationship.
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	To hold an innovative technology or expertise that may be recognized by other firms, and therefore attract them to cooperate with the firm.
	<b>Limitations</b>	What limitations is the approach subject to?	This approach has no explicit limitation of application
	<b>Advantages</b>	What are specific advantages of this method?	Involves relational and strategic alignments as well as technological alignment of the partners, instead of concentrating in only one of those aspects. Strategic and relational alignments with a potential partner ensure the sustainability of the partnership, reducing the possibility of a 'failed' partnership.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	The approach offers a holistic overview of how to proceed to ensure a successful partnership but does not specify how or from where to select the potential partners. (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Technological alignment. Develop a mutual understanding of technologies and their implications in the market (A firm can seek them deliberately, or come across these technologies during such avenues as meetings, conferences, etc.). 2. Strategic alignment (Motivation and goal correspondence). Establish a team to develop the initial codevelopment specifications. 3. Relational alignment. Determine financial and legal feasibility of codevelopment project and create organizational acceptance.
	<b>Other methods</b>	Are there any sub-methods used?	Interviews with managers from different companies
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Emden et al., 2006. <i>Collaborating for New Product Development, selecting the partner with maximum potential to create value</i>	
<b>Examples</b>	What are exemplary applications of the method?	In (Emden et al., 2006) four cases are described and studied about how a firm established a partnership for codevelopment alliances.	

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case		N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions				N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	



A2.23 CREAM: Criteria-Related Employability Assessment Method (Ripley 1994)

Method description	<b>Goal</b>	What is the specific goal of this method?	To select the best candidate among a vast group through chosen criteria, avoiding artificial barriers.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Employee within the firm
	<b>Input</b>	What input (data, information) is needed to apply this method?	Desired attributes in employees (in this case) Group of candidates to evaluate
	<b>Output</b>	What output (data, information) does this method deliver?	Methodical guideline to select specific employees
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Specific characteristics and requirements of what the firm looks for, even though the method walks the 'manager' through the decision
	<b>Limitations</b>	What limitations is the approach subject to?	Focused to selecting employees
	<b>Advantages</b>	What are specific advantages of this method?	The selection model and process reported here can be generalized and replicated in any organization, with specific criteria and requirements. (*) The CREAM system appears to be successful in creating fairness and equality of opportunity. Other methods used do not require a high amount of learning effort.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Long and effort requiring method
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Analysis of previous recruitment processes 2. Design of CREAM Workshop for Criteria Determination and Interview Training (RIPS) 3. Conduction of the workshops and examination of results 4. Model recommendations 5. Oral boards and results
	<b>Other methods</b>	Are there any sub-methods used?	RIPS method; Task-Analysis-People orientation inventory (TAP)
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Ripley 1994. <i>CREAM: Criteria-Related Employability Assessment Method: A Systematic Model for Employee Selection</i>	
<b>Examples</b>	What are exemplary applications of the method?	As described in (Ripley and Ripley, 1994), The Phoenix Fire Department conducted	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.24 Innovative capacity-based evaluation (Hunter et al. 2012)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	To establish an environment where generation of new ideas can occur by ensuring that talented individuals are interacting with each other on a frequent basis.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Technical/ Employees
	<b>Input</b>	What input (data, information) is needed to apply this method?	Pool of candidates entering a company, or current employees the firm might want to assess.
	<b>Output</b>	What output (data, information) does this method deliver?	Evaluation of potential partners
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Pool of candidates entering a company, or current employees the firm might want to assess.
	<b>Limitations</b>	What limitations is the approach subject to?	Not all predictors are discussed in the paper due to space constraints. Also, contextual moderators exist that may influence the utility of the predictors discussed
	<b>Advantages</b>	What are specific advantages of this method?	The criteria and evaluation methods could be implemented in an already existing recruitment process. The approach invites the company seeking to hire innovative employees to build a system based on the proposed attributes, but it also leaves the possibility to use them as an assessment method to both current and potential workers(*)
	<b>Disadvantages</b>	What are specific disadvantages of this method?	It does not offer a methodical guideline to decide whether to hire a candidate (or not). (*) Lack of a holistic magnitude to compare the evaluation of a candidate with some defined requirements or between one another(*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	The approach provides the key knowledge, skills, abilities, and "other" (KSAO) attributes most predictive of creativity and innovation to develop a specific selection method. It also proposes specific methods to assess those characteristics and their relative weight towards innovative output of employees.
	<b>Other methods</b>	Are there any sub-methods used?	Situational judgement tests; Simulation and assessment; Interviews
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Hunter et al., 2012. <i>Hiring an innovative workforce: a necessary yet uniquely challenging endeavor</i>	
<b>Examples</b>	What are exemplary applications of the method?	No examples described in the source	

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.25 Algorithm-based search with production-distribution planning (Su et al. 2015)

Method description	<b>Goal</b>	What is the specific goal of this method?	Integrating partner selection, production, distribution and operations scheduling decisions to minimize the total cost related to partnership establishment between companies, production and distribution of items, inventory and tardiness penalty					
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Logistics company					
	<b>Input</b>	What input (data, information) is needed to apply this method?	Input required by the mathematical model (companies, components, final product, etc.). Candidate partners					
	<b>Output</b>	What output (data, information) does this method deliver?	Most optimal operation schedule in terms of time and cost, including assigning a partner to a task					
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Adequate software to compute the algorithm (*) Candidate partners					
	<b>Limitations</b>	What limitations is the approach subject to?	Candidates must be logistics' companies or similar					
	<b>Advantages</b>	What are specific advantages of this method?	Aims at minimizing the sum of the operating costs related to partner selection, and production–distribution of products, taking into account the various operational constraints when the manufacturing chain is operating under a multi-product, multi-stage, multi-production route, multi-machine, and multi-period manufacturing environment.					
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Takes into account many elements and data that might not be useful when adapting the approach to innovation partner-search High effort investment is required due to all the algorithms that have to be solved					
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Introduce the parameters needed and the sets of constraints that have to be respected. 2. Solve the function to be optimised by LGA or PSO. 3. Obtain the values for the previously unknown variables.					
	<b>Other methods</b>	Are there any sub-methods used?	Hybrid algorithm which combines the techniques of Particle Swarm Optimization(PSO) (Clerc & Kennedy, 2002; Kennedy, 1997); Genetic Algorithm with Learning Scheme (LGA)					
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Su et al., 2015. <i>Integrated partner selection and production–distribution planning for manufacturing chains</i>					
<b>Examples</b>	What are exemplary applications of the method?	No examples of the implementation of this approach are described in the source						
Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.26 Algorithm-based search for logistics' partners (Bueyuekoezkan et al. 2008)

Method description	<b>Goal</b>	What is the specific goal of this method?	To provide a decision support to make a careful assessment of e-logistics partner, using a multi-criteria decision-making (MCDM) system
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	External logistic companies
	<b>Input</b>	What input (data, information) is needed to apply this method?	Group of potential partners
	<b>Output</b>	What output (data, information) does this method deliver?	Ranking of considered partners
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Group of potential partners, and enough information about the potential partners to evaluate all the necessary criteria Adequate software to solve the algorithm proposed (*)
	<b>Limitations</b>	What limitations is the approach subject to?	As explained in the source, the approach is focused to find a logistics partner
	<b>Advantages</b>	What are specific advantages of this method?	Multiple evaluators versus a single evaluator avoid the bias and minimize the partiality in the decision process; two groups of evaluation criteria are proposed: strategic aspects of the partner and aspects of the partner's business/technical aspects (such as partners' technical expertise, partners' performance, partners' quality, and managerial experience).
	<b>Disadvantages</b>	What are specific disadvantages of this method?	The evaluation of criteria is made using a ratio scale instead of a discrete scale, which is simpler and easier to use.
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Identify the most important strategic alliance partner evaluation criteria. 2. Build criteria hierarchy and determine the criteria weights with the fuzzy AHP method. 3. Conduct the fuzzy Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to achieve the final partner-ranking results.
	<b>Other methods</b>	Are there any sub-methods used?	Multiple criteria decision-making (MCDM): fuzzy Analytic Hierarchy Process (AHP) to determine the relative weights of evaluation criteria, and the fuzzy extension of the Technique for Order Preference by the Similarity to Ideal Solution (TOPSIS) to select the partners.
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Büyükoğuzkan et al., 2008. <i>Selection of the strategic alliance partner in logistics value chain</i>
<b>Examples</b>	What are exemplary applications of the method?	Within the same paper, a study was conducted to investigate three strategic alliance proposals for ABC Logistics (turkish company).	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case		N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions				N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.27 ANP-based search for strategic alliance partners (Chen et al. 2008)

Method description	<b>Goal</b>	What is the specific goal of this method?	Partner selection via adapting relative weights of criteria according to the priority of motivations for establishing strategic alliance
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Other firms
	<b>Input</b>	What input (data, information) is needed to apply this method?	Group of potential partners with high knowledge about them
	<b>Output</b>	What output (data, information) does this method deliver?	A suitability index for each of the studied partners, so that the enterprise with the highest index should be selected as the partner.
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	All data needed to evaluate the attributes of each candidate (*) Software to solve the model (*)
	<b>Limitations</b>	What limitations is the approach subject to?	Neglecton of the possible inner dependence among criteria and sub-criteria, although than can be coped with by choosing them properly. External factors that may influence the selection process are not taken into account.
	<b>Advantages</b>	What are specific advantages of this method?	It deals with the interdependence between the criteria for selecting partners and the motivation for forging a collaboration alliance. The defined criteria offered by the approach cover strategic and technical attribute of the potential partners The approach can meet different situations by adapting the relative weights of criteria and attributes according to the relationship between the criteria and motivations, enabling decision-makers to think more comprehensively before conducting a selection process.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	High mathematical solving effort External factors that may influence the decision or the success of the prospective alliance are not taken into account
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Establish the motivation priority to forge the alliance, and build a pairwise comparison matrix for criteria with respect to the highest motivation. 2. Set adequate weights for criteria according to priorities in step 1. 3. For each criterion, measure relative tendency of motivation by pairwise comparison. 4. Create a "super-matrix" between the clusters of criteria and different motivations. Then analyze the relative importance of the attributes of each criterion. 5. Partner evaluation: evaluate each attribute for each candidate, obtaining tables with the relative suitability of each studied potential partner with respect to each attribute. 6. Calculate the suitability index for each candidate. Analytical Network Process (ANP)
	<b>Other methods</b>	Are there any sub-methods used?	
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Chen et al., 2008. <i>Applying ANP approach to partner selection for strategic alliance</i>
	<b>Examples</b>	What are exemplary applications of the method?	A chinese precision machinery company (an SME) evaluates potential partners to forge an alliance for developing technology (in Chen 2008).

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown				N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary				N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection				N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case		N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions				N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.28 AHP-based search for strategic alliance partners (Chen et al. 2010)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	Select an adequate partner for strategic alliance.					
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	R&D partner					
	<b>Input</b>	What input (data, information) is needed to apply this method?	A group or potential partners, and specific information about them to conduct the method.					
	<b>Output</b>	What output (data, information) does this method deliver?	Specific suitability index for each candidate company					
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Pre-selected group of candidates					
	<b>Limitations</b>	What limitations is the approach subject to?	Already established criteria, so the focal firm has to fit their motivation and criteria in the given ones (*)					
	<b>Advantages</b>	What are specific advantages of this method?	Avoiding the plight of subjective comparison and weighting of criteria. Criteria and sub-criteria are taken into account, which is helpful when evaluating companies with closer levels of performance or where candidates have its own merits in particular sub-criteria. Using an approximate approach based on the extension principle of fuzzy set theory for handling the multiplication of fuzzy numbers diminishes the load of calculation and enhances the applicability of this proposed approach.					
	<b>Disadvantages</b>	What are specific disadvantages of this method?	High resolution effort. (*)					
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Identify the motivations to forge an alliance and determinate their associate intensities. 2. Calculate the relative weights for criteria with respect to each motivation. 3. Obtain the composite relative important weights for criteria multiplying their relative weights by the intensities of the corresponding motivation.					
	<b>Other methods</b>	Are there any sub-methods used?	Analytic Hierarchy Process (AHP)					
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Chen et al., 2010. <i>An analytical hierarchy process approach with linguistic variables for selection of an R&amp;D strategic alliance partner</i>						
<b>Examples</b>	What are exemplary applications of the method?	A precision machinery company that designs and manufactures reduction and						
<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners	assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.29 Co-development alliance partners algorithm-based search (Bo Feng et al. 2010)

Method description	<b>Goal</b>	What is the specific goal of this method?	To select the desired partners for a codevelopment alliance from a candidate partner set
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Another firm/ 'Strategic' actors
	<b>Input</b>	What input (data, information) is needed to apply this method?	Group of potential partners and enough information about them to fulfil the attributes needed for their evaluation
	<b>Output</b>	What output (data, information) does this method deliver?	Ranking of the studied partners regarding their suitability
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Group of potential partners Adequate software to compute the algorithm
	<b>Limitations</b>	What limitations is the approach subject to?	Acknowledgement that data in other forms (besides linguistic terms) may be involved in the decision, and therefore 'straightforward' and 'pragmatic' decision-making approaches need to be investigated.
	<b>Advantages</b>	What are specific advantages of this method?	Not only the individual utility of each candidate is focused on, but also the collaborative utility, reducing the uncertainty of future cooperation.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	It does not integrate data in other forms (but linguistic terms) (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Construction of an individual utility matrix and a collaborative utility matrix (elements in form of linguistic terms). 2. Use of FMADM approach to respectively compute the overall assessment values of individual and collaborative utility. 3. Obtention of overall assessment value for each candidate through integration of the assessment values of individual utility and collaborative utility. 4. Obtention of the ranking order of all candidates.
	<b>Other methods</b>	Are there any sub-methods used?	Fuzzy Multiple Attribute Decision-Making (FMADM)
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Feng et al., 2010. <i>A method for partner selection of codevelopment alliances</i>
	<b>Examples</b>	What are exemplary applications of the method?	In (Feng et al., 2010) an application of the method can be found with the chinese company <i>Baosight</i>

		Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
Goal	<b>Process phase</b>	In which phase is the approach to be implemented?						
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity			N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform		N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors		N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task		N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high			N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly		N/A	

A2.30 Algorithm-based search with transportation scheduling (Dao et al. 2014)

Method description	<b>Goal</b>	What is the specific goal of this method?	To solve partner selection for multiple projects and intelligent transportation scheduling in Virtual Enterprises in order to minimize global costs while achieving the required performance standard.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	TECHNICAL/Product development and material sourcing companies
	<b>Input</b>	What input (data, information) is needed to apply this method?	Potential partner enterprises, with information such as transportation cost, transportation time and performance index about them. Sub-projects the focal firm wants to delegate
	<b>Output</b>	What output (data, information) does this method deliver?	Optimal solution of the problem, indicating the best partner for each (sub)project.
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Group of smaller companies amongst whom the firm wants to select some of them to partner with. (And specific data about the potential partners) Information about the projects that are being delegated, such as processing cost, earliest start time, processing time. Software to solve the mathematical problem (in the example, <i>Matlab</i> is used) (*) Sub-projects to 'offer'. (*)
	<b>Limitations</b>	What limitations is the approach subject to?	Suitable for a firm that looks for delegating tasks together with transportation
	<b>Advantages</b>	What are specific advantages of this method?	Two problems at the same time: partner selection for more than one project and integrated transportation scheduling. The collaborative transportation has also economical and environmental advantages. Easy access to other information found in the solution variables, e.g. number of selected partners, partners involved in each (sub)project, etc.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Solvers cannot guarantee the feasible solution. There is no GA working best for every optimisation problem and customisations in chromosome encoding and genetic operations are always required
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Establish the (sub)projects that are being delegated. 2. Invite other companies to tender the rest of (sub)projects 3. All the data about the principal enterprise, the potential partners and the projects themselves is introduced in a mathematical model, that processes assumptions, parameters, constraints, etc with an objective function. An optimal solution is obtained through a GA based approach.
	<b>Other methods</b>	Are there any sub-methods used?	Genetic Algorithm (GA) with unique dynamic chromosome representation and modified genetic operations
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Dao et al., 2014. <i>Optimisation of partner selection and collaborative transportation scheduling in Virtual Enterprises using GA</i>
	<b>Examples</b>	What are exemplary applications of the method?	Case study with an automobile enterprise, comparing the results with three commercial solvers

		Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies																												
								quality	quantity	well known	vaguely known	completely unknown	none	useful	necessary	open search	search within a pool of potential partners	assessment	OI-project team	other actors	self-selection	general overview	abstract guide	methodical guide	descriptive	implementation on case	overview of topic	user needs	solutions	none	community	web-platform	none	single OI-actors	groups of OI-actors
Goal	<b>Process phase</b>	In which phase is the approach to be implemented?																																	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?					N/A																												
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?					N/A																												
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?					N/A																												
	<b>Type of method</b>	What is the type of the method?					N/A																												
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?					N/A																												
	<b>Level of abstraction</b>	How specific is the method description?					N/A																												
	<b>Additional results</b>	What are potential additional results besides OI-actors?					N/A																												
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?					N/A																												
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?					N/A																												
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?					N/A																												
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?					N/A																												
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?					N/A																												



A2.31 Strategic alliance algorithm-based evaluation method (Wu et al. 2009)

Method description	<b>Goal</b>	What is the specific goal of this method?	To select alliance partners for entering competitive advantage in the marketplace.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Any type; in the study case, studied potential partners are suppliers.
	<b>Input</b>	What input (data, information) is needed to apply this method?	Potential partners. Importance given to each of the proposed criteria
	<b>Output</b>	What output (data, information) does this method deliver?	Overall score for each potential partner
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Software to compute the model (*) Need to have access to very specific information about the potential partners
	<b>Limitations</b>	What limitations is the approach subject to?	Recommended not evaluating a high number of candidates at a time due to the high number of weighted criteria scored; the example compares 3 prospective partners
	<b>Advantages</b>	What are specific advantages of this method?	ANP is able to reduce judgmental in strategic partner selection process Gain of an overall score, which makes it easy to compare the suitability between the candidates and therefore rank them regarding the set of criteria Criteria are extensively detailed, covering different aspects of candidates
	<b>Disadvantages</b>	What are specific disadvantages of this method?	It offers a closed list of criteria, so the firm cannot introduce the attributes they would like to evaluate in a potential partner.
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Define and decompose the problem 2. Define criteria for partner selection 3. Design the hierarchy 4. Perform pair-wise comparison and prioritization 5. Calculate the weights of the criteria 6. Weight the alternative partners 7. Compute the overall score of each prospective partners
	<b>Other methods</b>	Are there any sub-methods used?	Analytical Network Process (ANP)
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Wu et al., 2009. <i>The analytic network process for partner selection criteria in strategic alliances</i>	
<b>Examples</b>	What are exemplary applications of the method?	Study case to prove the method in (Wu et al., 2009), involving the selection of a	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A	
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A	
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A	
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A	
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A	
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A	
	Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
		<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
<b>Concretisation of search direction</b>		How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.32 Market simulation-based search (Atallah 2005)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	To explore how firms choose their R&D collaboration partners
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Other firms in the marketplace
	<b>Input</b>	What input (data, information) is needed to apply this method?	Three firms within a marketplace with all their needed internal information
	<b>Output</b>	What output (data, information) does this method deliver?	Best option in regard with the three proposed firms: no cooperation, cooperation among all firms and cooperation between only a pair of firms. Also the output of all firms is given (regardless they cooperate or not).
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Necessary software to perform the model (*)
	<b>Limitations</b>	What limitations is the approach subject to?	Only 3 firms at a time can be studied
	<b>Advantages</b>	What are specific advantages of this method?	The model applies to symmetric as well as to asymmetric firms. It explicitly analyzes the incentives for different types of firms with different types of partner
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Very specific procedure
	<b>Procedure</b>	What are the steps to conduct to perform this method?	Given the proposed partners, the model is executed. It has two stages: 1. Firms invest in R&D, taking into account whether they have cooperation partners or not. 2. Firms compete on the output market.
	<b>Other methods</b>	Are there any sub-methods used?	A simulation has to be performed
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Atallah 2005. <i>Partner selection in R&amp;D cooperation</i>
<b>Examples</b>	What are exemplary applications of the method?	The method is applied to an hypothetical case	

		Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	quality	quantity			N/A	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	well known	vaguely known	completely unknown		N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	none	useful	necessary		N/A	
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	open search	search within a pool of potential partners	assessment		N/A	
	<b>Type of method</b>	What is the type of the method?	OI-project team	other actors	self-selection		N/A	
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Level of abstraction</b>	How specific is the method description?	overview of topic	user needs	solutions			N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	none	community	web-platform			N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	single OI-actors	groups of OI-actors		N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	rough topic	precise terms	definition of task		N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	low	high			N/A	
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	no	yes, adapted	yes, directly		N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?					N/A	

A2.33 Algorithm-based search for a horizontal strategic alliance partners (Solesvik, Encheva 2010)

Method description	<b>Goal</b>	What is the specific goal of this method?	Facilitate evaluation of potential partners, and to select the most appropriate partner for horizontal strategic alliances.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Firm for a horizontal collaboration, not being in the same supply chain
	<b>Input</b>	What input (data, information) is needed to apply this method?	Group of prospective partners, and specific information about them
	<b>Output</b>	What output (data, information) does this method deliver?	Concept lattice, that allows the investigation and interpretation of relationships between concepts, objects, and attributes. The concepts are arranged hierarchically.
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Inability to collect "complete information" regarding all potential partners during the selection process. Software to compute the necessary algorithms (*)
	<b>Limitations</b>	What limitations is the approach subject to?	Concept lattices is comprehensible for decision-makers only when lattices are not too big (low number of objects and attributes). This approach has not focused on partner selection criteria which are important in the partner selection process.
	<b>Advantages</b>	What are specific advantages of this method?	Utilization of FCA allows a firm to visually analyze a potential partner for a horizontal strategic alliance. The FCA tool is associated with numerous advantages, notably, relative simplicity and versatility of visual analysis when compared with other mathematical approaches such as the analytic hierarchy process, the analytic network process, optimization modeling, and fuzzy set logic.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	It focuses in horizontal collaborations (between firms who are not in the same supply chain).
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Establishing the expected competences from the future partner, and a context (parameter for the FCA method). 2. Cross-table between potential partners (objects) and competences(attributes). 3. In order to make connections in cross-tables more transparent, data are presented graphically in a concept lattice.
	<b>Other methods</b>	Are there any sub-methods used?	Formal Concept Analysis (FCA)
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Solesvik and Encheva, 2010. <i>Partner selection for interfirm collaboration in ship design</i>
	<b>Examples</b>	What are exemplary applications of the method?	An example in (Solesvik, 2010) explains how a ship design firm that intends to sign a contract to develop a new type of platform supply vessel to be used in Arctic waters seeks a partner firm that has some competencies they lack of.

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.34 University-Industry algorithm-based search (Ning, Xue-wei)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	To establish a long-term University-Industry relationship
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Universities
	<b>Input</b>	What input (data, information) is needed to apply this method?	Potential partners and their firm characteristics
	<b>Output</b>	What output (data, information) does this method deliver?	Matrix showing all the interrelationships between the criteria
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Necessary software to held the solving of the model (*)
	<b>Limitations</b>	What limitations is the approach subject to?	Limited for University/Research institutes search (in the source). Actually can be enhanced to be generally applied.
	<b>Advantages</b>	What are specific advantages of this method?	Compared with the traditional selection method based on AHP, the method based on ISM and ANP has broader practical significance. The list of criteria cover both technical and strategic aspects. Interaction between criteria is taken into account.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	The criteria cover a general evaluation of the potential partners but do not take into account the specific issue/task that is being held. (*)
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Fulfil questionnaires to weight the UI alliance partner selection evaluation criteria and sub-criteria. 2. ANP applied to analyze the interrelationships between one criteria and another. 3. Through ISM method, the complex interrelationships in UI alliance partner selection evaluation system can be transformed into matrix model, and the final interrelationships of evaluation system are acquired by a series of matrix operations.
	<b>Other methods</b>	Are there any sub-methods used?	Analytic network process (ANP); Interpretive structural modeling (ISM)
<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Ning and Xue-wei, 2006. <i>University-Industry alliance partner selection method based on ISM and ANP</i>	
<b>Examples</b>	What are exemplary applications of the method?	Case study explained in (Ning and Xue-wei, 2006)	

<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A	
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A	
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners	assessment			N/A	
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A	
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation on case	N/A	
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A	
	<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
		<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
<b>Concretisation of search direction</b>		How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A	
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A	

A2.35 Decision support system for innovation partner selection (Hacklin et al. 2006)

Method description	<b>Goal</b>	What is the specific goal of this method?	To provide a multi-perspective and interactive overview of potential venture partners to the decision-makers
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Strategic partner/ Other firms
	<b>Input</b>	What input (data, information) is needed to apply this method?	Data to fulfill the given criteria about the potential partners Pool of preselected partners
	<b>Output</b>	What output (data, information) does this method deliver?	A cockpit chart summarizing the main outcomes of comparing the benchmarked
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Pool of preselected partners Data about potential partners must be collected anonymously Adequate software to compute the model (*)
	<b>Limitations</b>	What limitations is the approach subject to?	Appropriate for the implementation of partner selection on a one-to-one basis. For building up long-term and sustainable partnerships, however, a broader, network-oriented, partnership portfolio management perspective should be maintained
	<b>Advantages</b>	What are specific advantages of this method?	Takes into account restricted benchmarking conditions.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	As it is gathered anonymously, the evaluation of the prospective partners depends completely on the point of view of the respondents
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Set the list of potential partners and gather their primary available information. 2. Complete the interrogative issues, in which the listed criteria (with three layers: strategy, cultural, structural criteria) have been transformed, to completely characterize the firms anonymously. 3. Run the DS4iP model, whose output must be interpreted and discussed among the coach team.
	<b>Other methods</b>	Are there any sub-methods used?	Strategy–Culture–Structure (SCS)-based approach; Computer Facilitated Qualitative Data Analysis (CQDA)
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Hacklin et al., 2006. <i>Strategic venture partner selection for collaborative innovation in production systems: A decision support system-based approach</i>
<b>Examples</b>	What are exemplary applications of the method?	Assistance and coaching of an actor in the renewable energy sector throughout the collaborative innovation set-up phase, in (Hacklin et al., 2006)	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation on case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.36 Multi-Aspect Partner and Service Selection Method (Paszkievicz, Picard 2010)

<b>Method description</b>	<b>Goal</b>	What is the specific goal of this method?	Allows a Virtual Organization- planner to select appropriate services and partners based on their competences and their relations with other services/partners
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	VO partner
	<b>Input</b>	What input (data, information) is needed to apply this method?	Set of partners and required roles
	<b>Output</b>	What output (data, information) does this method deliver?	Matching between partners and their best-fitting roles
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Set of partners from where to select Software to compute the model (*)
	<b>Limitations</b>	What limitations is the approach subject to?	The method is based on the assumption that a VO planner is the only responsible person/organization for the selection process
	<b>Advantages</b>	What are specific advantages of this method?	Integrating competencies, social aspects and performance, through the direct evaluation of a partner for a specific role
	<b>Disadvantages</b>	What are specific disadvantages of this method?	It is not an open search but a method to assign a partner to a specific role, so having a defined role is necessary
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Definition of VO specification (requirements and associated preferences) 2. Selection of partners and services for roles: selection of candidate elements for each defined role. 3. VO variant generation: sorted set of variants ranked according to a fitness function (using a GA to determine the best fitted VO variants) 4. Performance evaluation: assignment of selected elements to process activities and validation of performance requirements 5. VO inception: registration of the new VO in competence and service repository
	<b>Other methods</b>	Are there any sub-methods used?	Genetic Algorithms (GA);
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Paszkievicz and Picard, 2010. <i>MAPSS, a Multi-Aspect Partner and Service Selection Method</i>
<b>Examples</b>	What are exemplary applications of the method?	Implemented in the ErGo system within the ITSOA project, (Paszkievicz and Picard, 2010)	

		Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
<b>Goal</b>	<b>Process phase</b>	In which phase is the approach to be implemented?						
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity			N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners	assessment			N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
<b>Preconditions</b>	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform		N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors		N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task		N/A	
<b>Effort</b>	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high			N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly		N/A	

A2.37 Algorithm-based supplier search (Feng et al. 2011)

Method description	<b>Goal</b>	What is the specific goal of this method?	Select a pool of desired suppliers from pre-determined candidate suppliers for the provision of different SPE to achieve multi-service outsourcing with regard to create a long-term relationship.
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Supplier
	<b>Input</b>	What input (data, information) is needed to apply this method?	Set of pre-determined candidates that have to be assigned and tasks that have to be outsourced
	<b>Output</b>	What output (data, information) does this method deliver?	The most suitable supplier for the task is identified
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Set of pre-determined candidates that have to be assigned and tasks that have to be outsourced Acceptable price and waiting time for each service for which we look for a supplier Necessary software to compute the model (*)
	<b>Limitations</b>	What limitations is the approach subject to?	The approach is focused on supplier selection, so it will need to be adapted to an innovation-partner context. (*)
	<b>Advantages</b>	What are specific advantages of this method?	This approach overcomes the limitation in the existing decision-making methods for supplier selection, which only focus on the individual utilities.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Short number of criteria to evaluate the suitability of a potential supplier
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Determine pre-candidate suppliers 2. Define collaborative criteria (which indicate the potential collaborative level between partner firms) depending on the type of firm and issue handled, e. g. service system sharing, interface management compatibility, mutual technology supports, resource complementarity, overlapping knowledge bases, motivation correspondence, goal correspondence, compatible cultures. etc. 3. Evaluate candidate firms and normalize the criteria values to make them comparable 4. Obtain overall value for each candidate 5. Define objective and constraints: a model for supplier selection minimizing costs and time, and maximizing the collaboration utility between partners. 6. Compute the multi-objective heuristic algorithm for solving the model
	<b>Other methods</b>	Are there any sub-methods used?	Multi-objective algorithm based on TS
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Feng et al., 2011. <i>A decision method for supplier selection in multi-service outsourcing</i>
<b>Examples</b>	What are exemplary applications of the method?	The method is implemented in CSA, a main air transportation firm of China, who plans to outsource a portion of its services (in Feng et al., 2011).	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A

A2.38 Algorithm-based supplier search with qualitative and quantitative data (Toloo, Nalchigar 2011)

Method description	<b>Goal</b>	What is the specific goal of this method?	To identify the most efficient supplier in presence of both cardinal and ordinal data
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Suppliers
	<b>Input</b>	What input (data, information) is needed to apply this method?	Group of proposed suppliers
	<b>Output</b>	What output (data, information) does this method deliver?	Cardinal, ordinal and bounded data about the studied suppliers Table ranking most efficient suppliers
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	Software to solve the proposed mathematical model (*) Chosen set of suppliers to evaluate, knowing very specific data about them
	<b>Limitations</b>	What limitations is the approach subject to?	Only applicable for evaluating suppliers
	<b>Advantages</b>	What are specific advantages of this method?	The method identifies best supplier by solving only one mixed integer linear programming (MILP). Takes into account both quantitative and qualitative data.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	The model ranks the suppliers only by factual data, compatibility between companies and such are no taken into account
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Introducing the set of suppliers with their respective demanded data 2. Solving the proposed model 3. Obtaining most suitable suppliers, ranked by their efficiency as suppliers
	<b>Other methods</b>	Are there any sub-methods used?	Integrated Data Envelopment Analysis (DEA) model; method for ranking DMUs by simultaneously considering cardinal and ordinal data;
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Toloo and Nalchigar, 2011. <i>A new DEA method for supplier selection in presence of cardinal and ordinal data</i>
<b>Examples</b>	What are exemplary applications of the method?	Implementation example explained in (Toloo and Nalchigar, 2011)	

Goal	<b>Process phase</b>	In which phase is the approach to be implemented?	Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity				N/A
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation on case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform			N/A
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors			N/A
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task			N/A
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high				N/A
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly			N/A



A2.39 Criteria-based ranking method (Afshari et al. 2010)

Method description	<b>Goal</b>	What is the specific goal of this method?	Selecting the best one amongst five personnel and also ranking them
	<b>Partner type</b>	What kind of partner is the OI-team looking for? Are they strategic or technological OI-actors?	Employees
	<b>Input</b>	What input (data, information) is needed to apply this method?	Candidates and information about them to complete the required criteria
	<b>Output</b>	What output (data, information) does this method deliver?	Table of ranked personnel by their score
	<b>Requirements</b>	Is there any e.g. special data required to conduct the method?	To interview the candidates to obtain specific information. Adequate software to compute the algorithm (*)
	<b>Limitations</b>	What limitations is the approach subject to?	The SAW ignores the fuzziness of executives judgment during the decision-making process.
	<b>Advantages</b>	What are specific advantages of this method?	This method is a proportional linear transformation of the raw data, which means that the relative order of magnitude of the standardized scores remains equal. Simple software such as MS Excel can be used, and the processing time is not high.
	<b>Disadvantages</b>	What are specific disadvantages of this method?	Criteria that have a qualitative structure cannot be measured precisely. It allows to evaluate and rank a low number of candidates at a time.
	<b>Procedure</b>	What are the steps to conduct to perform this method?	1. Select relevant criteria and their weight 2. Collect data by required method (e. g. questionnaires) 3. Computing weights of criteria by using comparison matrix 4. Check consistency, and review the pairwise comparison iteratively until it matches. 5. Use the SAW method to rank the candidates and determine the best one
	<b>Other methods</b>	Are there any sub-methods used?	Saaty's 1-9 scale of pairwise comparisons;
	<b>Relevant sources</b>	Which are relevant literature sources to gain background knowledge of this method?	Afshari et al., 2010. <i>Simple Additive Weighting approach to personnel selection problem</i>
	<b>Examples</b>	What are exemplary applications of the method?	A case of a Telecommunication in Iran that wants to sort the five candidates who have passed the exam is described in (Afshari et al., 2010).

		Analysis of current SHs	Structuring SHs and initial assessment	Search for new potential OI-partners	Assessing potential OI-partners	Ranking and selecting OI-partners	Developing cooperation strategies	
Goal	<b>Process phase</b>	In which phase is the approach to be implemented?						
	<b>Result focus</b>	Does the method focus on a large number of results or a lower number with higher quality?	quality	quantity			N/A	
	<b>Degree of newness</b>	How new or unknown are the identified actors to the company?	well known	vaguely known	completely unknown			N/A
	<b>Degree of interaction</b>	Does the method require an interaction with external actors?	none	useful	necessary			N/A
	<b>Type of method</b>	What is the type of the method?	open search	search within a pool of potential partners		assessment		N/A
	<b>Identification of potential OI-actors</b>	Who does the potential OI-actors identify?	OI-project team	other actors	self-selection			N/A
	<b>Level of abstraction</b>	How specific is the method description?	general overview	abstract guide	methodical guide	descriptive	implementation case	N/A
	<b>Additional results</b>	What are potential additional results besides OI-actors?	overview of topic	user needs	solutions			N/A
Preconditions	<b>Existing infrastructure / tools</b>	Does the method require specific infrastructure?	none	community	web-platform		N/A	
	<b>Already known OI-actors</b>	Does the method require already known actors as a starting point?	none	single OI-actors	groups of OI-actors		N/A	
	<b>Concretisation of search direction</b>	How precise does the search direction need to be defined?	rough topic	precise terms	definition of task		N/A	
Effort	<b>Preparation</b>	How much effort is necessary up front and during the conduction of the method (e.g. for software implementations)?	low	high			N/A	
	<b>Re-usability</b>	Can the invested preparations (e.g. software or sub-methods) or search results be used for other searches?	no	yes, adapted	yes, directly		N/A	

## A3 Assessment of partner search approaches

### A3.1 Collaboration experience based open search (Li et al. 2008)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities	X			
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
3.6 Ensure sustaining internal commitment over sufficient time			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description			X	
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.2 OI-partner-type based open search (Chen 2014)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities			X	
1.2 Provide an overview of the strategic relevance of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence			X	
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project				X
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description			X	
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project			X	

## A3.3 Customer-type based open search (Desouza et al. 2008)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain		X		
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only			X	
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence			X	
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description			X	
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.4 Pyramiding (Hippel 2006)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential,		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain		X(*)		
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only		X(*)		
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence		X		
3.2 ... have an absorptive competence			X	
3.3 ... have an integration competence			X	
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.5 Broadcast search (Ili 2010)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities	X			
1.2 Provide an overview of the strategic relevance of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating	X			
2.2 Not require the publication of internal information, to prevent knowledge drain			X	
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X(*)		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X(*)		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence	X			
3.2 ... have an absorptive competence			X	
3.3 ... have an integration competence	X			
3.4 ... have the competence to maintain control over a project				X
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X(*)		

## A3.6 Social media as an OI-tool (Mount, Martinez 2014)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic relevance of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating	X			
2.2 Not require the publication of internal information, to prevent knowledge drain			X	
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only			X	
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X(*)		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence	X			
3.2 ... have an absorptive competence			X	
3.3 ... have an integration competence	X			
3.4 ... have the competence to maintain control over a project				X
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X(*)		

## A3.7 Suggestion system based open-call search (Fairbank, Williams 2001)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic relevance of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating	X			
2.2 Not require the publication of internal information, to prevent knowledge drain			X	
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X(*)		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence	X			
3.2 ... have an absorptive competence			X	
3.3 ... have an integration competence	X			
3.4 ... have the competence to maintain control over a project		X(*)		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description			X	
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X(*)		



## A3.8 Marketplaces: platforms for open call partner-search (Nguyen et al. 2014)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities	X			
1.2 Provide an overview of the strategic relevance of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating	X			
2.2 Not require the publication of internal information, to prevent knowledge drain			X	
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X(*)		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence	X			
3.2 ... have an absorptive competence			X	
3.3 ... have an integration competence	X			
3.4 ... have the competence to maintain control over a project				X
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project	X(*)			

### A3.9 Technological-complementarity based patent database search (Byungun Yoon, Bomi Song 2014)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities	X			
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating			X	
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation	x			
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X		
3.3 ... have an integration competence		X		
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

### A3.10 University-Industry matching system through patent database search (Yamada et al. 2013)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating	X			
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation	X			
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X		
3.3 ... have an integration competence		X		
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.11 Technology-need based patent database search (Jeon et al. 2011)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation	X			
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X		
3.3 ... have an integration competence		X		
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.12 EEN Database search case study (Holzmann et al. 2014)

		YES	P	NO	N/A
1	<b>General requirements from OI characteristics</b>				
1.1	Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities	X			
1.2	Provide an overview of the strategic skills of the potential partners			X	
2	<b>Requirements for reducing risks</b>				
2.1	Analyse the motivation and/or interests of potential partners in cooperating			X	
2.2	Not require the publication of internal information, to prevent knowledge drain	X			
2.3	Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4	Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5	Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X		
3	<b>Requirements with regard to the company</b>				
	The approach must allow and support the company to ...				
3.1	... have a disclosure competence	X(*)			
3.2	... have an absorptive competence		X(*)		
3.3	... have an integration competence		X(*)		
3.4	... have the competence to maintain control over a project	X			
3.5	... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
4	<b>Requirements for approach efficiency</b>				
4.1	Contain a detailed step-by-step process description	X			
4.2	Look specifically for innovation partners	X			
4.3	Rank potential partners according to their suitability to the project		X		

## A3.13 Technological-proximity based patent database search (Angue et al. 2014)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities	X			
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating			X	
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation	X			
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X		
3.3 ... have an integration competence		X		
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.14 Technology-recurrence based patent database search (Cordeiro et al. 2014)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities	X			
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating			X	
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation	X			
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X		
3.3 ... have an integration competence		X		
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.15 Knowledge distance based patent database search (Baum et al. 2010)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating			X	
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation	X			
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X		
3.3 ... have an integration competence		X		
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		



## A3.16 Netnography (Belz, Baumbach 2010)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2 Not require the publication of internal information, to prevent knowledge drain	X(*)			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only			X	
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation	X			
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners		X		
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.17 Screening (Hippel 2006)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2 Not require the publication of internal information, to prevent knowledge drain	X(*)			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only			X	
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation	X			
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.18 Cobranding partner pool-based search guidelines (Newmeyer et al. 2014)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities			X	
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2 Not require the publication of internal information, to prevent knowledge drain	X(*)			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only		X		
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation			X	
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description			X	
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project			X	

## A3.19 Cobranding partner pool-based selection (Prince, Davies 2002)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities			X	
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2 Not require the publication of internal information, to prevent knowledge drain	X(*)			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only		X		
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation			X	
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description			X	
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project			X	

## A3.20 OI-quality match pool-based search (Manotuvgorapun 2015)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2 Not require the publication of internal information, to prevent knowledge drain	X(*)			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners		X		
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.21 Innovative capacity-based screening (Matthing et al. 2006)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2 Not require the publication of internal information, to prevent knowledge drain	X(*)			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only		X		
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X		
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners		X		
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.22 Collaborative NPD partner evaluation (Emden et al. 2006)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2 Not require the publication of internal information, to prevent knowledge drain			X	
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only		X		
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable	X			
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation			X	
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence		X		
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners		X		
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners	X			
4.3 Rank potential partners according to their suitability to the project		X		

## A3.23 CREAM: Criteria-Related Employability Assessment Method (Ripley 1994)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2 Not require the publication of internal information, to prevent knowledge drain			X	
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation			X	
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence		X		
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners	X			
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description		X		
4.2 Look specifically for innovation partners			X	
4.3 Rank potential partners according to their suitability to the project		X		



## A3.24 Innovative capacity-based evaluation (Hunter et al. 2012)

		YES	P	NO	N/A
1	<b>General requirements from OI characteristics</b>				
1.1	Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2	Provide an overview of the strategic skills of the potential partners		X		
2	<b>Requirements for reducing risks</b>				
2.1	Analyse the motivation and/or interests of potential partners in cooperating		X		
2.2	Not require the publication of internal information, to prevent knowledge drain	X(*)			
2.3	Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4	Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5	Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation	X			
3	<b>Requirements with regard to the company</b>				
	The approach must allow and support the company to ...				
3.1	... have a disclosure competence				X
3.2	... have an absorptive competence		X(*)		
3.3	... have an integration competence		X(*)		
3.4	... have the competence to maintain control over a project		X		
3.5	... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners		X		
4	<b>Requirements for approach efficiency</b>				
4.1	Contain a detailed step-by-step process description			X	
4.2	Look specifically for innovation partners	X			
4.3	Rank potential partners according to their suitability to the project		X		

## A3.25 Algorithm-based search with production-distribution planning (Su et al. 2015)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence				X
3.3 ... have an integration competence				X
3.4 ... have the competence to maintain control over a project			X(*)	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners			X	
4.3 Rank potential partners according to their suitability to the project	X			

## A3.26 Algorithm-based search for logistics' partners (Bueyuekoezkan et al. 2008)

		YES	P	NO	N/A
1	<b>General requirements from OI characteristics</b>				
1.1	Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2	Provide an overview of the strategic skills of the potential partners			X	
2	<b>Requirements for reducing risks</b>				
2.1	Analyse the motivation and/or interests of potential partners in cooperating				X
2.2	Not require the publication of internal information, to prevent knowledge drain	X			
2.3	Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4	Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5	Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
3	<b>Requirements with regard to the company</b>				
	The approach must allow and support the company to ...				
3.1	... have a disclosure competence				X
3.2	... have an absorptive competence				X
3.3	... have an integration competence				X
3.4	... have the competence to maintain control over a project		X(*)		
3.5	... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
4	<b>Requirements for approach efficiency</b>				
4.1	Contain a detailed step-by-step process description	X			
4.2	Look specifically for innovation partners			X	
4.3	Rank potential partners according to their suitability to the project	X			

## A3.27 ANP-based search for strategic alliance partners (Chen et al. 2008)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X(*)	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project	X			

## A3.28 AHP-based search for strategic alliance partners (Chen et al. 2010)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X(*)	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project	X			

## A3.29 Co-development alliance partners algorithm-based search (Bo Feng et al. 2010)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only		X		
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X(*)	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project	X			

## A3.30 Algorithm-based search with transportation scheduling (Dao et al. 2014)

		YES	P	NO	N/A
1	<b>General requirements from OI characteristics</b>				
1.1	Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2	Provide an overview of the strategic skills of the potential partners		X		
2	<b>Requirements for reducing risks</b>				
2.1	Analyse the motivation and/or interests of potential partners in cooperating				X
2.2	Not require the publication of internal information, to prevent knowledge drain	X			
2.3	Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4	Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5	Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
3	<b>Requirements with regard to the company</b>				
	The approach must allow and support the company to ...				
3.1	... have a disclosure competence				X
3.2	... have an absorptive competence				X
3.3	... have an integration competence				X
3.4	... have the competence to maintain control over a project		X		
3.5	... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
4	<b>Requirements for approach efficiency</b>				
4.1	Contain a detailed step-by-step process description	X			
4.2	Look specifically for innovation partners			X	
4.3	Rank potential partners according to their suitability to the project	X			

## A3.31 Strategic alliance algorithm-based evaluation method (Wu et al. 2009)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities			X	
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence				X
3.3 ... have an integration competence				X
3.4 ... have the competence to maintain control over a project			X(*)	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project	X			



## A3.32 Market simulation-based search (Atallah 2005)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities			X	
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X(*)	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project		X		

### A3.33 Algorithm-based search for a horizontal strategic alliance partners (Solesvik, Encheva 2010)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities			X	
1.1				
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X(*)	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project		X		

## A3.34 University-Industry algorithm-based search (Ning, Xue-wei)

		YES	P	NO	N/A
1	<b>General requirements from OI characteristics</b>				
1.1	Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2	Provide an overview of the strategic skills of the potential partners			X	
2	<b>Requirements for reducing risks</b>				
2.1	Analyse the motivation and/or interests of potential partners in cooperating				X
2.2	Not require the publication of internal information, to prevent knowledge drain	X			
2.3	Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4	Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5	Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation		X		
3	<b>Requirements with regard to the company</b>				
	The approach must allow and support the company to ...				
3.1	... have a disclosure competence				X
3.2	... have an absorptive competence		X(*)		
3.3	... have an integration competence		X(*)		
3.4	... have the competence to maintain control over a project	X(*)			
3.5	... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
4	<b>Requirements for approach efficiency</b>				
4.1	Contain a detailed step-by-step process description	X			
4.2	Look specifically for innovation partners		X		
4.3	Rank potential partners according to their suitability to the project	X			

## A3.35 Decision support system for innovation partner selection (Hacklin et al. 2006)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities			X	
1.2 Provide an overview of the strategic skills of the potential partners		X		
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project			X(*)	
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners		X		
4.3 Rank potential partners according to their suitability to the project		X		

## A3.36 Multi-Aspect Partner and Service Selection Method (Paszkievicz, Picard 2010)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable		X		
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners			X	
4.3 Rank potential partners according to their suitability to the project	X			

## A3.37 Algorithm-based supplier search (Feng et al. 2011)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence				X
3.3 ... have an integration competence				X
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners			X	
4.3 Rank potential partners according to their suitability to the project	X			

## A3.38 Algorithm-based supplier search with qualitative and quantitative data (Toloo, Nalchigar 2011)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
1.1 Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence				X
3.3 ... have an integration competence				X
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners			X	
4.3 Rank potential partners according to their suitability to the project	X			

## A3.39 Criteria-based ranking method (Afshari et al. 2010)

	YES	P	NO	N/A
<b>1 General requirements from OI characteristics</b>				
Provide an overview of the technical skills of potential partners to increase solution potential, both through gaining people who can give information on customer/market needs or about				
1.1 solution possibilities		X		
1.2 Provide an overview of the strategic skills of the potential partners			X	
<b>2 Requirements for reducing risks</b>				
2.1 Analyse the motivation and/or interests of potential partners in cooperating				X
2.2 Not require the publication of internal information, to prevent knowledge drain	X			
2.3 Not focus in customers as potential partners, to avoid the dependence on customer views, demands and personality only	X			
2.4 Avoid focusing the search to only one type of partner, failing to overview all different kinds of partners and missing some of them that might be more suitable			X	
2.5 Ensure the participation of potential partners capable of radical innovation, to avoid limiting output to mere incremental innovation				X
<b>3 Requirements with regard to the company</b>				
The approach must allow and support the company to ...				
3.1 ... have a disclosure competence				X
3.2 ... have an absorptive competence		X(*)		
3.3 ... have an integration competence		X(*)		
3.4 ... have the competence to maintain control over a project		X		
3.5 ... identify and assign eligible gatekeepers towards actors, supporting the communication between the firm and the external partners			X	
<b>4 Requirements for approach efficiency</b>				
4.1 Contain a detailed step-by-step process description	X			
4.2 Look specifically for innovation partners			X	
4.3 Rank potential partners according to their suitability to the project	X			