2012•2013
FACULTEIT BEDRIJFSECONOMISCHE WETENSCHAPPEN
master in de toegepaste economische wetenschappen:
innovatie en ondernemerschap

Masterproef

Managing technology based consortia

Promotor :
Prof. dr. Wim VANHAVERBEKE

Copromotor :
Prof. dr. Anna ROIJAKKERS

Steven Tielemans

Masterproef voorgedragen tot het bekomen van de graad van master in de toegepaste economische wetenschappen , afstudeerrichting innovatie en ondernemerschap

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KNOWLEDGE IN ACTION

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Foreword

This thesis is my final step on a lengthy path towards the degree of Master in Business Economics at Hasselt University. The process of writing this thesis has not always been easy. Fortunately, I had help in many forms.

First of all, I would like to thank my promoter Prof. dr. Vanhaverbeke for the opportunity to work on this interesting subject and for his assistance and critical feedback.

Secondly, I want to thank Heidi Hamers at CTMM and Hugh Laverty and Magda Gunn at IMI, for lending me their time and providing me with all this information.

Furthermore, heartfelt thanks to my wife, Mariella, for her endless support, understanding and patience during my journey along this long and winding road. Also, thanks to my friends for their support and honest feedback.

And last but not least, my utmost thanks to Melanie Hoeyberghs for her help and encouragement these past few years. Thanks for being my guiding light in dark days. Much obliged.

Steven

August 2013

"In the future, we are wonderful people…"

Dan Ariely

Summary

Nowadays, companies are more and more teaming up as 'increasing costs and complexity of R&D, the shortening of the technology life cycles, increasingly knowledgeable suppliers and clients, the growth of venture capital and the growing diffusion of leading-edge knowledge in universities and research laboratories' (Vanhaverbeke, 2006) forces them to look for partners to collaborate with. The times that a company had all knowledge in-house and could develop everything on its own are long gone. Today, they can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology (Chesbrough, 2003). Companies are not only collaborating through the well-established bilateral alliances with just two partners, but also in larger and more complex alliances with several partners. In this thesis we will take a closer look at a particular type of multi partner alliance: the R&D consortium. Olk (1999) described this type of alliance as 'a legal entity, established by two or more organizations that pool resources and share decision making for cooperative research and development activities'. These R&D consortia mainly focus on 'precompetitive' research (Mothe et al., 2001), and sometimes are joined by governmental agencies, NGO's, national labs and university researchers (Ring et al., 2005). In that last case it is called a public-private partnership (PPP). R&D consortia are sometimes assisted by organizations that offer support in the innovation process and play a significant role in the network system in order to create possibilities for every member; we call these organizations 'facilitators'.

In the different chapters of this thesis we will try to find an answer on following research questions: 'Can it be beneficial to use a R&D consortium in order to cooperate, conduct research and promote innovation ?', and 'Can a facilitator play an important role in developing R&D consortia and fueling innovation ?'. In the second chapter you can find a literature study, in which we start with a brief and general overview of Open Innovation (OI), followed by the main part about alliances. Literature on alliances can be found in abundance, but we tried to focus on the topics we handled in the case studies. So, we start with some general literature on alliances, then followed by literature regarding multi partner alliances. After that we will have a closer look at two specific types of multi partner alliances, which we already mentioned above, namely: R&D consortia and public-private partnerships (PPP). As firms nowadays also have to pay attention to what happens beyond the borders of their own company and the alliances they are in, at the end of this chapter we also briefly discuss innovation ecosystems. Before we started with the literature study, we knew that some literature would be scarce. For example, there is quite some literature to be found on R&D consortia, but most of it was not relevant for this thesis. Furthermore, regarding 'facilitators' we found no information at all, and that is what makes the next chapter, the case studies, so important.

In the third chapter there are two case studies of facilitators, both public-private partnerships. The first one is CTMM (Center for Translational Molecular Medicine) which is located in Eindhoven, and initiated and partially funded by the Dutch government. The other one is IMI (Innovative Medicines Initiative) located in Brussels, and initiated and funded by the European Commission and Efpia (European Federation of Pharmaceutical Industries and Associations, represents the pharmaceutical industry operating in Europe). Both case studies are based on in-depth interviews we had with key people of both organizations. We chose to use case studies because, as mentioned earlier hardly any literature is available and 'one strength of theory building from cases is its likelihood of generating novel theory' (Eisenhardt, 1989). Furthermore, 'at the root of in-depth interviewing is an interest in understanding the experience of other people and the meaning they make of that experience' (Seidman, 1998). Both case studies provide us with an interesting insight of what happens behind the doors of these organizations.

In chapter 4 we analyze our findings from literature and case studies, and combine them in order to answer our research questions . We decided to build the analysis around following four points that are important in one or both case studies: networks, performance, risk and cost. Furthermore, we also focus on the factors that have a mediating impact on the performance of the consortium, namely : subsidies, facilitators and contracts. At the end, we discuss some other topics where we found a link between findings in the cases and literature.

In the final chapter we answer our research questions with our findings in the analysis of the previous chapter. The success of a R&D consortium lies in the fact that 1+1 seems to be more than 2 when you look at the collaboration on innovation. In both literature and the case studies, it showed that the multi-disciplinarity of the members and the different skills brought to the collaboration are key to the success. At the end of the chapter we can conclude that both our research questions can be answered positively. The first question, 'can it be beneficial to use a R&D consortium in order to cooperate, conduct research and promote innovation ?', we answer by explaining a model we created based on the four points, mentioned earlier: networks, performance, risk and cost. The model also includes the mediating factors: subsidies, facilitators and contracts. Our second research question, 'can a facilitator play an important role in developing R&D consortia and fueling innovation?' we answer by listing and explaining the different tasks a facilitator can take care of: subsidies, contracts and management. By the last one we mean overall management and not project management in particular; it can also be subdivided in following tasks: driver, administrator, controller and mediator.

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1 Introduction

In a fast changing world, where everything that's new today will be old-fashioned tomorrow, companies as well need to innovate at the speed of light. Since Henry Chesbrough in 2003 came up with his Open Innovation paradigm, in which he encouraged companies that 'they can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology', it seems that companies focus more and more on outside sources to broaden innovative scope. Forced by 'increasing costs and complexity of R&D, the shortening of the technology life cycles, increasingly knowledgeable suppliers and clients, the growth of venture capital and the growing diffusion of leading-edge knowledge in universities and research laboratories' (Vanhaverbeke, 2006) , companies are more and more looking for partners to collaborate with, 'forced to team up to develop or absorb new technologies, commercialize new products, or simply stay in touch with the latest technological developments' (Vanhaverbeke 2006).

In this thesis we will have a look at a particular type of alliance: the R&D consortium, which Olk (1999) described as follows: 'a legal entity, established by two or more organizations that pool resources and share decision making for cooperative research and development activities'. We add a remark by Ring et al. (2005) that sometimes these R&D consortia are joined by governmental agencies, NGO's, national labs and university researchers. In that case it is a public-private partnership (PPP), which we will also discuss. Sometimes R&D consortia are also assisted by organizations that offer support in the innovation process and play a significant role in the network system in order to create possibilities for every member. We call these organizations 'facilitators'.

In the different chapters of this thesis we will try to find our way towards an answer on both our research questions, which are: 'Can it be beneficial to use a R&D consortium in order to cooperate, conduct research and promote innovation ?', and 'Can a facilitator play an important role in developing R&D consortia and fueling innovation ?'.

We will commence with a literature study, which can be found in chapter 1. We start off with a brief and general overview of Open Innovation (OI), which we already mentioned above. We will focus on the work by Henry Chesbrough and Wim Vanhaverbeke. Followed by the main part that deals about alliances. Literature on alliances can be found in abundance, but we tried to keep in mind to focus on the topics we wanted to handle in the case studies. We start with some general literature on alliances, followed by some regarding multi partner alliances. After that we handle two specific types of multi partner alliances, namely: R&D consortia and public-private partnerships, which are both relevant to the case studies later on. To end we very briefly discuss innovation ecosystems. We knew

upfront that relevant literature was scarce. There's quite some literature on R&D consortia, although most were not relevant for this thesis. Regarding facilitators we found no information at all, and that's what makes the next chapter so interesting.

In the third chapter you can find two case studies of two organizations that were created to boost innovation and their function is to facilitate R&D consortia. Their tasks and functions will be discussed in the case studies. These two organizations, or facilitators as we will call them from now on, are Center for Translational Molecular Medicine (CTMM) located in Eindhoven, and Innovative Medicines Initiative (IMI) located in Brussels. Both organizations are public-private partnerships, of which CTMM was launched and is supported by the Dutch government; whereas IMI was launched by Efpia (European Federation of Pharmaceutical Industries and Associations, represents the pharmaceutical industry operating in Europe) and the European Commission. This as well will be elaborated in both case studies. Both cases were provided by Prof. Vanhaverbeke. The main method for data collection were in-depth interviews with key people of both organizations. We have chosen to use this method because of the fact that 'at the root of in-depth interviewing is an interest in understanding the experience of other people and the meaning they make of that experience' (Seidman, 1998). Furthermore, 'one strength of theory building from cases is its likelihood of generating novel theory', as argued by Eisenhardt (1989). At CTMM we had an interesting meeting with managing director Heidi Hamers. At IMI we sat together with Hugh Laverty and Magda Gunn, respectively Senior Project Manager and Project Manager. Both interviews were recorded and transcribed afterwards. Based on these transcriptions, combined with notes taken during the interview, I built both case studies. These case studies give an interesting insight of what happens behind the doors of organizations of which can be found next to nothing in literature.

In the following chapter we will analyze our findings from literature and case studies, and combine them in order to find an answer to our research questions mentioned above. As already said, there is to be a blind spot in literature and our findings can shine a light on this. We built the analysis around four points that showed to be important in one or both case studies. These categories are: networks, performance, risk and cost. Besides that we also wanted to focus on mediating factors that seem to impact the performance of the consortium, namely : subsidies, facilitators and contracts. Furthermore, some other topics will be handled where we found a link between findings in the cases and literature. Whenever relevant literature was available on these subjects, it will be mentioned in the analysis.

In the final chapter we try to answer the research questions with our findings of chapter 4. It looks that the success of a R&D consortium lies in the fact that 1 + 1 seems to be more than 2 when you

look at the collaboration on research and innovation in a multi partner alliance. In literature as well as from the case studies it showed that the multi-disciplinarity of the members and the different skills they brought to the collaboration are key to the success. A company can no longer believe it has all knowledge in-house, and collaborating in a R&D consortium can bring that it joins different parties that are top in their area of expertise so they can join forces. All this creates some kind of leverage that makes collaboration on innovation in a consortium beneficial. Also, thanks to the R&D consortia it looks like a lot of projects were launched that would otherwise never have been initiated, or that firms in that case never would be able to succeed when doing it on their own. We also would like to refer to what in literature is called 'valley of death', meaning the fact that promising projects are put aside because of insufficient funding. Collaborating via a R&D consortium can help to avoid this 'valley of death'. At the end of the chapter we can conclude that both research questions, 'Can it be beneficial to use a R&D consortium in order to cooperate, conduct research and promote innovation?' and 'Can a facilitator play an important role in developing R&D consortia and fueling innovation ?', can be answered positively. We show this on the basis of two figures we developed based on our findings. We hope you enjoy reading this thesis and maybe will provide you with some new insights.

2 Literature study

2.1 Introduction

In this chapter you can find the literature study. We start with a short and general overview of Open Innovation. We focused on the work by Henry Chesbrough and Wim Vanhaverbeke on Open Innovation. Followed by the main part that deals about alliances. Literature on alliances can be found in abundance, but we tried to keep in mind to focus on the topics we wanted to handle in the case studies. We start with some general literature on alliances, followed by some regarding multi partner alliances. After that we handle two specific types of multi partner alliances, namely: R&D consortia and public-private partnerships, which are both relevant to the case studies later on. To end we very briefly discuss innovation ecosystems. Regarding the applied methodology, we mainly used online browsers like EBSCOhost via the UHasselt website and Google Scholar. When we found literature that looked promising, we skimmed the text briefly. When it was relevant to my thesis, we saved it on a hard drive, and read it properly afterwards. If we decided to use the text, we printed it and marked the relevant parts and added notes. Besides the online search, we got some books from the UHasselt library and bought some online at Amazon.com.

2.2 Open Innovation

During a large part of the previous century companies used to rely on their own internal capacity to generate and develop ideas. There was no exchange with the 'outside', in nor out, and unused ideas were shelved. Chesbrough (2003) calls this 'closed innovation'. Vanhaverbeke (2006) describes it as 'an internally focused logic where the innovation company trusts on internal capabilities to successfully innovate'. He adds that this logic was challenged because of: increasing costs and complexity of R&D, the shortening of the technology life cycles, increasingly knowledgeable suppliers and clients, the growth of venture capital and the growing diffusion of leading-edge knowledge in universities and research laboratories (Vanhaverbeke, 2006). It was Chesbrough (2003) who started promoting the term Open Innovation, which has become increasingly popular over the years. He defines Open Innovation as ' the use of purposive inflows and outflow of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively'. It is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal en external paths to market, as they look to advance their technology (Chesbrough, 2003).

The following 'funnel'-models will look familiar to most.

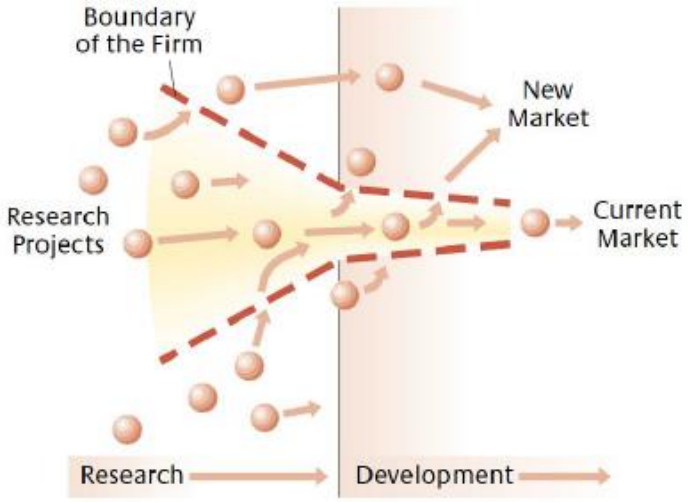

Figure 1 Open innovation model (Chesbrough, 2003)

In this model a company commercializes both its own ideas as well as those from other companies. In the other direction, they also seek ways to bring in-house ideas to market by going outside its current businesses. The boundary between the company and its surrounding environment is porous (dashed line), enabling innovations to move more easily between the two (Chesbrough, 2003). Regarding the use of Open Innovation in alliances Vanhaverbeke (2006) argues that 'Open Innovation is almost by definition related to the establishment of ties of innovating firms with other organizations. Companies are increasingly forced to team up with other companies to develop or absorb new technologies, commercialize new products, or simply stay in touch with the latest technological developments' (Vanhaverbeke, 2006). Also according to Vanhaverbeke (2006) Open Innovation can be analyzed at different levels: intra-organizational networks, firm level, dyad level (or inter-firm), inter-organizational networks and national & regional systems.

2.3 Alliances

Nowadays companies need to focus more and more on outside sources to broaden their innovative scope. As Sakakibara (2002) summarizes: firms increasingly rely on collaboration with other firms to conduct R&D activities (Gulati, 1995; Osborn and Hagedoorn, 1997). Regarding motivations to collaborate in R&D, Sakakibara (2002) combined the findings of several authors and came to the following three motivations how cooperation in R&D input market enhances R&D productivity: sharing fixed costs among R&D participants, realizing economies of scale in R&D, and avoiding "wasteful" duplication. After which she concludes that 'all three are scale-based motives, and that they imply that the principal purpose of cooperative R&D is to share costs'. Mothe et al. (2001) also refers to the 'wasteful duplication' and argues that R&D cooperation can eliminate this. Accessing

new markets and new suppliers can be an additional motive for firms to participate in multi partner alliances (Grant and Baden-fuller, 2004). Also, alliances can be a channel for knowledge (Gulati, 2000), if a partner is very satisfied with a third party, he might recommend that third party to other partners. Specifically to public-private partnerships (PPP, see later on), in Stevens et al. (2013) we can read that biopharmaceutical enterprises face major challenges : increased competition, falling R&D budgets, increasing regulatory hurdles, accelerating technological complexity, future patent cliffs, and declining numbers of promising projects in their drug pipelines. They continue by saying that the biotechnology industry realizes the potential of combining different ideas, skills, and expertise in technologically demanding areas and is increasingly tapping into early-phase research conducted at universities and SME's (Stevens et al., 2013).

According to de Rochemont (2010) SMEs participate in multi partner alliances to broaden their innovative scope, and by accessing resource from outside partners this results in new products and services and new technology. Some results of his research demonstrates 'that smaller firms are able to experience higher levels of alliance performance compared to larger firms. In Gomes-Casseres (1996) we can find an explanation: 'when firms are small relative to their rivals and to their market, they tend to use alliances to gain economies of scale and scope; when they are large in relative terms, they avoid alliances'. That last part may look a bit odd, as it seems to say that for larger companies there is no use in joining alliances. Later Gomes-Casseres (2003) also wrote that larger firms are less likely to form alliances because of 'deep pockets', meaning they have sufficient financial resources. This looks contradictory with 'the real world' and with the design of the consortia in the case studies later on. Also regarding SMEs: research by Stevens et al. (2013) has found that academic and industry partners acknowledged the difficult position for SMEs, and 'the limited return on investment they might expect'. But on the other hand, in the same research SMEs said that 'IP opportunities' are a motive to join. Sakakibara (2002) refers to a survey by Kleinknecht and Reijnen (1992) that found that 'firm size, market structure, R&D intensity, have little impact on R&D cooperation between firms'. Furthermore, regarding R&D in consortia, Sakakibara (2002) argues that 'firms with better R&D capabilities have a higher rate of participation in R&D consortia', and that 'past participation in large-scale R&D consortia motivates further participation'.

2.3.1 Multi partner alliances

It looks like the majority of research focuses on alliances of two firms, or bilateral alliances. However, there is an increasing interest in alliances with more than two partners, called multi partner alliances. This type of alliance is not specific for one type of industry/business, but occurs in several industries, for example Agri-food, semiconductor, telecom (de Rochemont 2010). Stevens et al. (2013) argue

‘straightforward collaborative models, such as outsourcing and bilateral contracts, have a proven track record in the pharmaceutical sector. Currently, alternative and more complex collaboration models are being explored’. Furthermore they state that in the health sector the number of multi-partner consortia (often based on a public-private partnership-model) is increasing. Gomes-Casseres (1996) remarks that multi partner alliances demand a stronger need for network governance and coordination compared to bilateral alliances.

In de Rochemont (2010) we find a definition of multi partner alliances, based on Lavie et el. (2007) and Vanhaverbeke and Cloodt (2006): a multi partner alliance is a collective**,** voluntary organizational association with more than two members, with common objectives, joint decision making and shared risks, who interactively engage in multilateral value chain activities, such as collaborative research, development, sourcing, production, marketing and commercialization of technologies, products, and/or services.

There can be various reasons why companies would join a multi partner alliance, such as: similar interests, a triggering entity or open solicitations (Doz et al., 2000). In Stevens et al. (2013) is argued that a public-private partnership is not the best way to generate IP, in that case ’partners are better off in a bilateral agreement’. Multi partner alliances can also be viewed as ‘a team of members from different organizations’, and because of above mentioned characteristics the alliance can be seen as ‘a dedicated social environment of the alliance members’ (de Rochemont 2010). The activities in a multi partner alliance involve partners with similar or different positions in the value chain, which can be either horizontal or vertical. Olk (1999), argues : ‘as a collaborative structure, consortia (and alliances by extension) reflect both the interests of the specific member and those of the collective’. Koza et al. (2000) distinguishes two types of alliances: learning alliances, focused on ‘sharing knowledge and learning’; and business alliances, ‘aimed at exploiting the competences of each partner to create new products or technologies’.

Regarding formation, in findings of a study by Stevens et al. (2013) industry interviewees indicated that ‘background IP was the most contentious part of negotiations’. Furthermore, all interviewees emphasize ‘a need for good agreements with clear definitions, and that ‘good communication, especially related to IP issues, results in good collaboration’. We also found in Stevens et al. (2013) that academic partners think it is important to screen potential partners in advance.

Regarding alliance size, Park et al. (1996) argue that each additional member in an alliance adds additional complexity. An increase in partners, increases the need for coordination, as each new partner may increase the chance of conflicting interest between companies in the alliance. Also,

having more than two partners leads to more possible conflicting interests which could lead to alliance failure (Park et al., 1996; Gomes-Casseres, 1996).

Multi partner alliances can have multiple advantages for firms that are participating (de Rochement et al., 2007). It allows firms to cover larger part of the value chain. Each member can bring unique resources to the cooperation, such as the deployment of personnel (Mothe et al., 2001), machines or production facilities or technical skills (Browing et al., 1995). The precise mix of members should depend on the competencies of each partner (Gomes-Casseres, 1996). De Rochemont (2010) adds that 'multi partner cooperation also provides information about and access to new partners', and also that 'the members in the alliance offer a gateway to other partners which may lead to even more resources, customers or suppliers'. In a special case, namely precompetitive public-private partnerships (PPP), Stevens et al. (2013) argue that these alliances should enhance 'basic knowledge, pooling of research data, and development of technology platforms'. They also say 'managers of precompetitive public-private partnerships (PPP) acknowledged the important networking opportunity, and saw new collaborations as a result'. Members of an alliance seem to value their involvement depending on the performance of the alliance: knowledge-related involvement was important when performance was poor, while network ties were credited with more importance when performance was good (Olk and Young, 1997). Young and Olk (1994) found that intangible involvement in (in a consortium), such as supplying researchers, managerial skills and expertise or having control over the alliance, increased a partner's commitment, while on the other hand tangible embeddedness did not.

You might expect managing multi partner alliances to be quite challenging and sometimes it will look like Chinese plate spinning. According to Olk (1999) during the formation, of primary concern to a member organization is determining the consortium's governance structure, particularly the member's influence on decision making. He defines influence as the impact a partner organization has on the alliance's activities. Regarding governance in alliances there are different views in literature (which by the way focus on dyadic alliances and has not been extended to multi partner alliances). Some promote formal governance (Garcia-Canal et al., 2003), which means the use of formalized mechanisms, such as legally binding agreements or contracts. Others are in favor of social or relational governance, which focuses on social mechanisms as for example mutual trust and social commitment (Das et al., 2002; Jones et al., 1997). Some authors are in favor of a combination (Poppo et al., 2002). Goshal et al. (1996) claim that formal governance negatively impacts relational governance, and suggest to prefer social controls. Osborn et al. (1990) argues that applying effective governance mechanisms is crucial for alliance success. Gomes-Casseres (1996) and Doz & Hamel (1998), claim that multi partner alliances require effective network governance and an adequate

degree of formal governance. Das and Teng (1998) and Jones et al. (1997) argue that multi partner cooperation demands strong social governance, as it is impossible to safeguard every action by formal contracting. De Rochemont (2010) argues that clear project management, resulting in for example clear task division and responsibilities, improves communication and lowers opportunism. Gomes-Casseres (1996) marks task definition as very important.

From some of his research data, de Rochemont concludes that the level of multi partner alliance formations remains stable, and also that the larger the number partners, the lower the formation rate. As a possible explanation, he refers to Gomes-Casseres (1996) and Das et al. (2002) by saying that this can be caused by the difficulty of governance in multi partner alliances. Effective management of multi partner alliances requires a wide variety of elements that managers should be able to recognize and manage. Vanhaverbeke et al. (2006) argue that this field of research demands a multidisciplinary approach. Ring et al. (2005) argue that when skillfully managed, it can lead (in their example for consortia) to strong awareness of convergent interests, strong social relationships and strong strategic relationships. 'When built on such foundations, they have much better chance on success.'

Managing complex structures as multi partner alliances (which includes consortia) apparently isn't that obvious. In 1999 Paul Olk wrote: 'as a new structure, member organizations have sought effective managerial approaches to consortia. For some, this knowledge may have developed through trial and error methods. For others, it has come from learning or copying other experiences – in other consortia or by other member organizations'. Regarding R&D PPPs (which are knowledge-based relations), Stevens et al. (2013) argue the management of IP rights is of critical importance. But in their study little consensus was found among interviewees on how the IP management should be optimally organized to preserve the interests of all parties.

In literature we can find some difficulties managers of multi partner alliances can encounter: free-riding, increased risk of conflicts, and resulting from the previous two, the greater the number of partners the larger the required additional coordination and communication costs. First, free-riding. When a collaboration is successful it can produce a 'public good', for example useful knowledge, which is accessible to all partners. The creation of this public good has the potential for free-riding. Meaning that members can enjoy the benefits of the public good, but without contributing to the creation (Dyer et al., 2000). This free-riding, and other opportunistic behavior, can undermine the development of trust, which is an important requirement for successful cooperation (Das et al., 2003). The second difficulty they might face, is the increased risk of conflicts. As the number of partners becomes bigger, the number of 'dyadic' relationships increases geometrically (Garcia-Canal

et al., 2003). It can also occur that there is internal competition, meaning that the partners also compete with one and other. A third possible problem, resulting from the previous two: a greater number of partners can lead to additional coordination and communication costs (Parkhe, 1993; Garcia-Canal, 2003) as a result of increased transaction costs. Gomes-Casseres (1996) also argues that the larger the group becomes, the more difficult the communication gets. An increase in partners also increases the transaction costs to monitor contractual terms (Park et al., 1996). Because of these potential risks, it is important to devote attention to making agreements about how value is created and is distributed, argues de Rochemont (2010). Both Dekker (2003) and Vanhaverbeke et al. (2006) say that a key issue in inter-organizational relationships concerns rules for value appropriation. Regarding to Gomes-Casseres (1996) these difficulties that may arise, lead to an increased effort for coordination and governance. Finally, in Stevens et al. (2013) we find an interesting remark, referring to the term 'valley of death', meaning 'the situation where risky projects are abandoned because of lack of funds required during extended time periods, rather than because of negative research outcomes'.

In research by Stevens et al. (2013) 'lack of trust' was highly ranked by all interviewees. In this study (on PPPs) that lack of trust proved to be related to 'IP hurdles'. In order to reduce search costs and risks of opportunism, companies tend to create stable relations characterized by trust and rich exchange of information with specific partners (Powell, 1990); then these embedded relationships accumulate into a network that becomes a repository of information on the availability and reliability of prospective partners (Powell et al., 1994); what then leads to the fact that organizations embedded in such networks are more likely to resort to that network for cues of their future alliance decisions (Gulati et al., 1999). Regarding reducing opportunism, Olk (1999) refers to other authors when arguing: 'many long-term alliances are governed by shared norms (Heide and John, 1992; Husted, 1994) which reduce the level of opportunism among the organizations' (Provan and Gassenheimer, 1994). In Stevens et al. (2013) we find that 'a good and clear IP framework from the start … is a proposed solution for the lack of trust'.

According to Olk and Young (1997) a company may, in addition to viewing consortium membership as an option on innovation, also enter into a consortium considering the future value of additional partnerships with other member organizations. Gomes-Casseres (1996) argues that the process of innovation and learning in multi partner alliances can be a difficult one. Olk and Young (1997) refer to Provan (1993) by arguing that 'the more ties an organization has to others in a network, the less likely it is that it will act opportunistically', and add that 'these ties may represent an increased level of trust' (Gulati, 1995). Regarding trust, Sakakibara (2002) argues, referring to Baumol (1993) that 'cheating in the cooperative R&D game can be easily detected in a repeated game situation, and

punishment to exclude a cheater from the following projects is very costly for a cheater. Therefore, firms that have repeatedly participated in R&D consortia can benefit from the sustained cooperation, which further motivate them to participate'. When trust is missing in an alliance, this could result in failure. Cullen et al. (2000) and Ireland et al. (2002) argue that low levels of trust also lead to an underdevelopment of social commitment between the parties, which is crucial for effective alliances. When organizations are part of an effective alliance, they appear to intentionally increase their embeddedness in that alliance and in the network of relationships (Olk and Young, 1997).

Good relations and experience in partnerships can result in continued partnership. Garcia-Canal et al. (2003) argues that partners who have previously maintained satisfactory cooperative relationships, start off with high levels of relational quality. Further we find that according to Doz et al. (1998) group members that have worked together previously 'may have gone through successful learning cycles'. Also, 'a company's experience in the management of alliances enhances the exploitation and internal diffusion of the partners' knowledge in subsequent alliances, as well as the capacity to manage the relationship with these partners' (Garcia-Canal et al., 2003). Steven et al. (2013) argue precompetitive partnerships are ideal platforms to get to know your partners. Research by Gulati (1999) found that 'a firm's connection to networks and the number of past alliances positively influences the propensity of alliance formation.' According to Olk and Young (1997), when a consortium performs better, member organizations appear to strengthen the inter-organizational relationship. Not only do they invest more and consider it more important, but they also have more ties with other members and do not seek alternative relationships. Further, these relationships appear to reinforce the member's continuity in the consortium (Olk and Young, 1997).

Young and Olk (1994) found evidence that learning in an alliance might lead to less commitment. 'Member organizations […] that had been highly embedded in the consortium and had already learned from it, were more likely to exit'. This corresponds according to Young and Olk (1994) to the argument that these members have assimilated the research and are ready to leave. 'For these members, departure is not a sign of failure but of success. Alternatively, for those members who are involved but have not learned, continued membership may reflect a failure of the consortium to meet their goals. This result offers additional support for questioning the general assumption that a member's decision to stay or leave automatically reflects alliance performance' (Young and Olk, 1994). Sakakibara (2002) quotes Kogut et al. (1992) when saying that the network of prior alliances provides information of new alliance opportunities, potential partners and their quality'. She concludes the experience of participation in past consortia can create a technological network through which a firm can gain access to technological resources of other firms (Sakakibara, 2002). An additional part about trust and IP can be found lower in the public-private partnership section.

Lorenzoni and Lipparini (1999) say that an active network orchestrator is vital. As having multiple partners may lead to conflicting interests, there can be a need for a partner who aligns all interests and insures the interest of the collective receives priority above individual interests (de Rochemont, 2010). In order to effectively manage multi partner alliances, several scholars stress the importance of clear leadership in the alliance, argues de Rochemont (2010). He continues by saying that for 'multi partner alliances, this function can be performed by network orchestrators'. He concludes by saying that 'effective network orchestrators foster stability in the group by minimizing internal competition among member firms'. Stevens et al. (2013) found that some precompetitive PPPs offer their help to SMEs during the negotiations and act as a neutral IP specialist ('honest broker'), which 'facilitates negotiations and IP management in the interests of all parties'. Stevens et al. (2013) also remark that 'SMEs pointed to their lack of experienced IP negotiators and the need for help during IP negotiations' and that 'industry had better lawyers, and the negotiations are all about finding the balance of power'. Furthermore, Stevens et al. (2013) argue that a managing body (in PPPs) can help to overcome IP hurdles.

In alliances there is a clear need for effective value creation and value capturing, what regarding to Doz et al. (1998) requires active network management. Contracts need to be well elaborated and should pay attention to the value appropriation. All partners should benefit from their participation in the alliance. Vanhaverbeke et al. (2006) argue that it is necessary to calculate benefits along the alliance to make sure all members get a fair return, 'so every participant stays committed'. Mothe et al. (2001) argue that (in R&D consortia) there is often 'a true creation of resources and value' and that it is one of the principal reasons for firms to become involved in R&D cooperation is 'to appropriate the results of the common R&D effort'. Stevens et al. (2013) argue that 'valuation of early stage research is difficult'. They add that 'industry representatives critiqued TTOs (Technology Transfer Offices, organizations dedicated to identifying research which has potential commercial interest and strategies for how to exploit it) for often overestimating the commercial value of IP'.

2.3.2 R&D consortia

R&D consortia are a subcategory within the multi partner alliances, with focus on cooperation for R&D purposes. According to Olk (1999) companies have created R&D consortia to facilitate the development of technological innovations. Sakakibara (2002) argues that forming R&D consortia has become an important alternative to firms R&D strategy.

Olk's (1999) definition of an R&D consortium is as follows: 'a legal entity, established by two or more organizations that pool resources and share decision making for cooperative research and development activities'.

Ring et al. (2005) remarks that sometimes these R&D consortia are joined by governmental agencies, NGO's, national labs and university researchers. In that case it is a public-private partnership, which will be discussed later on. Mothe et al. (2001) say that R&D consortia have mainly focused on 'precompetitive' research. Olk (1999) agrees by saying regarding R&D consortia that they have a distinguishing feature, namely their focus on pre-competitive activities. 'Concerns about rivalry, while certainly present, may be lower here than in alliances with the potential for more immediate impact on market competition'.

Relevant literature regarding R&D consortia seems limited. A lonely exception though is Sematech, which turns up in several articles. Regarding literature on R&D consortia, it looks like Paul Olk had a 'monopoly' for some time. First, he mainly focused on entrance and departure of members, and later on formation processes. Both parts will be discussed further. Literature also mostly focuses on US and Japanese consortia. Some findings: compared to Japan, US efforts towards consortia tend to be larger , to have more open-ended goals, and to conduct more research in a central location (Olk and Young, 1997). Olk and Young (1997) also say US consortia tend to conduct more research in a central location. Mothe et al. (2001) do not seem to agree with this characteristic of central research, and argue that as R&D consortia are characterized by a network organization, they 'do not possess a centralized or common research facility'.

Regarding entrance and departure, Olk and Young (1997) argue that following points are significantly related to a member's decision to stay or leave: satisfaction with performance, alternatives available, presence of additional network ties, knowledge-related involvement, and learning. When a member leaves the consortium it does not have to be the end of that consortium. Evan and Olk (1990) says that (as a consortium 'generally has more than two members') it is likely to continue to operate after a member leaves. They consider membership change to be separate from consortium stability. We repeat that Olk and Young (1997) argues that departure not always means poor performance; as for example learning by a member organization also can increase the likelihood of departure. Also, several founding members of SEMATECH left because of the great distance between their primary research focus and the consortium's (Browning et al., 1995). Olk and Young (1997) also found, as you would expect, that poor performance increased the likelihood a partner would exit, and that good performance increased the probability of remaining. They also found that network ties and knowledge-related involvement are positively related with continuity, while learning has a negative relationship. On the other hand it seems that importance of research and non-knowledge-related involvement does not affect continuity; and, what looks a bit odd, that the number of alternatives a partner has is positively related to continuity (Olk and Young, 1997). In a 1994 research Young and Olk (1994) found that the fewer options available and the more dependent on the consortium, the

more likely a partner was to remain a member. Regarding the presence of competitors, Olk and Young (1997) argue that a company may join a consortium because a competitor has already entered. On the other hand, the likelihood of a member leaving a consortium may increase following a key competitor's departure. Young and Olk (1994) note that the decision to stay in a consortium when satisfied is not the converse of the decision to leave a consortium when dissatisfied, but that it is a different decision because it occurs in a different context.

Ring, Doz and Olk (2005) distinguish 3 types of formation processes: the emergent, the engineered and the embedded. First, an emergent process is 'pulled by the strength of mutual interests and their convergence over time. If social and strategic relationships are relatively weak, the strength of mutual interest will pull the partners together. This process can, according to Ring, Doz & Olk (2005) occur when a new strong competition shows up, or when 'major technological discontinuities or disruptions challenge the knowledge base and question the future'. Secondly, there's the engineered process. In this process there is a key role for a triggering entity, that sees a need for collaboration more than others, so it is initiated by that entity rather than emerging from a joint decision of a group of partners. Finally, there's the embedded process. It's a result of 'a direct, positive relationship between developing awareness of external interdependence and defining expectations of continuity'. In this formation process the partners already have a 'strong social relationships at the onset of the alliance.

According Sakakibara (2002) governments want to know whether R&D consortia they support attract the right kind of firms from public policy perspectives. In economic studies cases have pointed out that the formation of R&D consortia could suppress competition in product markets (Katz 1986). Sakakibara (2002) refers to a survey by Kleinknecht and Reijnen (1992) that found that 'presence of government subsidies to promote R&D (and an affiliation with a group of companies) enhance the probability that a firm will engage in cooperative R&D'. Sakakibara (2002) argues that a government can be an intermediary of information and a facilitator of alliance formation, and also that ' if a government can credibly act as a moderator, the need to support alliances by building relational capital (Madhok and Tallman, 1998) or trust (Ring and Van de Ven, 1992) through past networks might be reduced. Firms might be able to save their investments in relational capital or trust, which are costly to develop. Our finding that past networks do matter in the setting of government-sponsored R&D consortia implies the critical role of past networks in facilitating a cooperation among firms'.

Sakakibara (2002) refers to Hamel (1991) when arguing that alliances can be viewed as opportunities for one partner to internalize the skills or competencies of the others to create next-generation

competencies. Partners in an alliance can come from different backgrounds and don't have to be competitors. According to Sakakibara (2002) 'firms in alliances are often recognized to possess heterogeneous capabilities, and they may or may not be direct competitors in the product market'. Furthermore, Sakakibara (2002) argues firms have knowledge (in particular technological knowledge) that is often "tacit", and not easily diffused across firm boundaries. She refers to Kogut (1988) when saying that 'an organizational vehicle, such as an alliance, is required to effect this transfer'.

2.3.3 Public-private partnerships

A specific kind of consortium is a public-private partnership (PPP). Stevens et al. (2013) defines it as follows: 'Collaborative models based on a contractual agreement between at least one not-for-profit organization (may be public-sector institutions, such as (inter)governmental agencies or civil society bodies) and at least one for-profit organization (such as pharmaceutical and biotechnology companies, which may be SMEs)'. The concept has evolved over time, so today PPPs can also include partners from the community sector, voluntary sector, and other (health) groups receiving funding from private and public sources. These groups are often initiated by (inter)governmental agencies to achieve a shared objective- the public interest- in a cost-efficient manner by combining multiple skills, expertise, and financial resources.

PPPs do not equal joint ventures or research investments between one public and one private partner. The term 'partnership' implies joint decision-making between a number of entities whereby the different parties jointly address issues with respect to resources, accountability, transparency, and conflict of interest.

Stevens et al. (2013) say 'precompetitive PPPs are a platform for partner scouting, networking, and selections', and furthermore conclude that the value of these partnerships lies in the opportunity to scout for and network with the best scientists, and that collaboration will be the only way to generate valuable IP. Roelofsen et al. (2011) see a special form of public-private collaboration that gets increased attention in public research policy: namely, large-scale, multidisciplinary research programs, that include both research institutes and companies, revolve around broad and emerging scientific fields and are instigated by the government. These public-private research consortia have to deal with a heterogeneous stakeholder network (Roelofsen et al., 2011).

Precompetitive public-private partnerships (PPPs) traditionally focus on research activities situated before the actual drug development process. These PPPs aim to solve basic research questions and to generate technology platforms, research tools, and predictive models to advance knowledge about disease pathways. Such activities precede the market exploitation phase and offer

opportunities to reduce throughput time and risks associated with such predevelopment phases. Specifically, concerning the precompetitive R&D public-private partnership model, Stevens et al. (2013) say it is still in its infancy, which means there is still much to learn about its design and implementation. Knowledge development through sharing is enhanced in precompetitive partnerships. Taking into account the multifaceted partnering model of precompetitive PPPs and the heterogeneity of partners, including their often conflicting mission, objectives, and cultures – it is not surprising that IP rights play a pivotal role and that IP and trust issues are part of the negotiation process.

Possible motives for participation in a precompetitive PPP differ. Whereas academia and public sector institutions primarily perform fundamental research, the role of industry is focused on clinical development of candidate products. Whereas academic researchers are focused on publishing results, industry tries to generate return on investment and increase profits. Whereas academia participates in precompetitive PPPs in return for research funding, the life sciences industry participates in strategic partnerships with academia to gain additional insights and knowledge in the first phases of the drug development lifecycle: the pre-discovery an drug discovery phase. Besides all that image building or political reasons can also provide motives for participation (Stevens et al.,2013).

Some findings regarding motives **pro** joining a PPP, according to research by Stevens et al. (2013):

- motives for industry, SMEs and academia 'innovation' and 'enhancement of expertise in a specific field'

- pharmaceutical company experts highlighted 'creativity', 'risk-sharing', 'cost reduction' and 'avoiding duplication' as important drivers to participate.

- Academia and TTOs (Technology Transfer offices) indicated 'money' one of the main motives besides 'project scope' and 'publication possibilities'. Academia added 'image' and 'status'

- SMEs thought 'money' to be imported, as well as 'knowledge transfer', 'IP opportunities'

- Both industry and academia mentioned 'complementarity of knowledge and disciplines' and 'generating information on (possible) future partners'

- 'networking possibilities' and 'top scientists participating in the project' proved to be important considerations for participation, as well as 'fear of missing out'

Stevens et al. (2013) also highlighted that participation of a European agency (such as EMA) was considered to be welcome by their interviewees, and in particular for 'guidance and early involvement in regulatory approaches for innovative ideas'.

Motives **against** participation (Stevens et al 2013) :

- 'lack of trust', which was indicated as a common reason impeding participations

- 'IP hurdles', 'secrecy issues' and 'fear of giving away know-how' seemed to be major concerns to all partners. (Which can be seen as remarkable as 'IP opportunities' were not rated high as a driver for participation)

- when the interviewees had experience in participating PPPs they also added 'the administrative burden' and 'PPPs organizational structure'.

- Pharmaceutical companies and TTOs argued 'high cost' and 'lack of innovation' could be a reason for non-participation.

Regarding IP versus trust we found following remarkable findings at Stevens et al. (2013):

- Lack of 'access to background IP' (meaning pre-existing IP made available to the partners prior to the start of the project) or, conversely, 'access to background' that reaches too far, were both related to a 'lack of trust' among partners (Stevens et al. 2013).

- Also, by granting broad access to background IP, academia and SME's feared 'losing exclusivity and therefore their position to negotiate deals with future interested actors'.

- Furthermore academia and SMEs suggested that industrial parties wanted them to offer technology at bargain prices.

- On the others side, at same time they feared that not participating in a project would result in 'loss of visibility' and, even worse, that their core technology could be surpassed by alternative solutions and that 'interesting IP opportunities' might be missed (Stevens et al., 2013).

- Industry interviewee stated that the commercial value of IP often overestimated by the TTO (Technology Transfer Office) and that they often do not acknowledge the risks for pharmaceutical companies

In this study most interviewees agreed that 'foreground' IP does not cause as many problems. Finally, Stevens et al. (2013) argue that there does not seem to be 'an ideal IP framework that suits all purposes'.

2.3.4 Innovation Ecosystems

Innovation Ecosystem is a relatively new concept. When it comes to innovation, firms nowadays have to look further than their own company and alliances, and should pay attention to other parties in their surroundings that may be involved or impacted. Adner and Kapoor (2010) come with the example of Airbus's A380. Airbus faced 'substantial challenges in designing and manufacturing the core airframe of the airplane'. But, as Adner and Kapoor (2010) argue, Airbus has to look beyond this internal challenge, because it also relies for subassemblies on suppliers that are confronted themselves with significant innovation challenges. Furthermore, airports need to develop new infrastructure to accommodate these oversized aircraft, regulators need to specify new safety procedures, new simulators need to be developed to train pilots, etc. Adner and Kapoor (2010) conclude: the A380 innovation ecosystem thus comprise not only airbus, but also its upstream suppliers, downstream buyers and complementors.

In his book The Wide Lens (2012), Adner argues that innovators need to be aware of two new kinds of risks: co-innovation risk and adoption chain risk. Firstly, (complementor) co-innovation risk, measures the likelihood of failures associated with innovation interdependencies of complements. The extent of the co-innovation risk depends on the probability that all of your ecosystem partners will be able to satisfy their innovation commitments within a specified time frame. Finally, adoption chain risk, measures the likelihood that when one or more intermediairies are placed along the value chain between the innovation and the end consumer, these players will make the necessary adaptations to their own activities to allow the innovation to reach optimum sales in the market (Brian Leavy, 2012).

3 Case studies

3.1 Introduction

In this chapter you can find two case studies of two organizations that were created to boost innovation and their function is to facilitate R&D consortia. Their tasks and functions will be the discussed in the case studies. The two organizations we are talking about are Center for Translational Molecular Medicine (CTMM) located in Eindhoven, and Innovative Medicines Initiative (IMI) located in Brussels. Both organizations are public-private partnerships, of which CTMM was launched and is supported by the Dutch government; whereas IMI was initiated by the European Commission and Efpia (European Federation of Pharmaceutical Industries and Associations, represents the pharmaceutical industry operating in Europe). This as well will be elaborated in both case studies.

Both cases were selected by Prof. Vanhaverbeke, who had already been in contact with these organizations, and provided me with the names of the people I could contact within the organizations. The main method for data collection would be in-depth interview chosen because of the fact that 'at the root of in-depth interviewing is an interest in understanding the experience of other people and the meaning they make of that experience' (Seidman, 1998). So I contacted both organizations and they replied quite fast and positive to my request for an in-depth interview. At CTMM I had a meeting with Heidi Haemers, managing director at CTMM. At IMI I sat together with Hugh Laverty and Magda Gunn, respectively Senior Project Manager and Project Manager. At both organizations I asked two hours to take the interviews, so we would have plenty of time to go through all topics, which they granted me. Both interviews took around one hour and fifteen minutes and were recorded by voice recorder. For the interviews I did not use a list of questions, but rather a list of topics and subtopics I wanted to discuss. The people at IMI asked me to send them this list of topics upfront. The recordings were transcribed in the weeks after the meetings; verbatim where possible and occasionally non-verbatim, for example when both interviewees talked to each other, when an interviewee did not finish his sentence, or when a part was to extended and had no added value. As the interview at CTMM was in Dutch, I translated it into English after the transcription. During the interviews I also made additional notes, which I also added to the transcriptions. These transcriptions were sent to the interviewees for review. I received no feedback of any of the interviewees. Based on the transcriptions of the interviews I started building the case studies. Yin (2003) defined a case study as 'an empirical inquiry that investigates a contemporary phenomenon within its real-life context'.

We preferred case studies as 'one strength of theory building from cases is its likelihood of generating novel theory' (Eisenhardt, 1989), and we used more than one case study as that 'provides as stronger base for theory building' (Yin, 1994).

To start with, I color-coded the parts which I thought belonged together, and removed or shortened parts that I believed to be too extended or non-relevant. After finalizing the case studies I listed up the main points and issues that were mentioned and covered during the meetings, and used these main points as a basis for my analysis and comparison with literature.

3.2 CTMM

How it all began

"Well, at the time of the first call … " she digs into her memory, musing, "CTMM just didn't exist. We had to build it from scratch, create it of out of the blue". It's a cold late winterday and we are sitting in the office of Heidi Hamers, managing director at CTMM. Her office has a rather nice view and overlooks the High Tech Campus, a former Philips site, located in Eindhoven in the south of Holland. It now houses several high-tech companies, and Open Innovation guru, Henry Chesbrough, recently called this site an innovation hotspot. Heidi continues: "Initially we were only two, scientific director Peter Luyten and myself. We were the first two employees of CTMM, and we had to start to put a team together. But in the meantime the first call was already ongoing. That meant we had to work fast to get everything up and running. People needed to be trained and master the details of their job. We had to implement a management-tool, and by that I mean the IT-system to manage the projects. So, we needed all hands on deck to be ready". It all looked very promising and they now had to live up to the expectations.

And now for something completely different…

CTMM, a public-private partnership (PPP), stands for Center for Translational Molecular Medicine. It is what's called in Holland a TTI, Technologisch Topinstituut (Technologic Top Institute). At the start CTMM was financed with one of the largest subsidies ever to be allocated to a TTI, mainly because of the bright future perspectives that were held out in the businessplan. Heidi refers to the subsidy as 'FES money'. FES, which is short for 'Fonds Economische Structuurversterking' (which can be translated as Economic Structure Enhancing Fund), is a fund established with the revenue Holland receives from the sales of its natural gas. The largest part of those profits are spent on physical infrastructure (like roads and bridges for example), but a fraction goes to knowledge infrastructure as well. When established in 2006, CTMM was one of the last initiatives to be financed with money

from this FES fund. The current government decided not to continue with this strategy and spend the money elsewhere (for example to reduce the national debt).

The financing of the TTI-constructions happened as follows: research consortia were formed with both academic and private partners, and the contributions made by these partners were doubled by the government. So this means that for each euro invested by the industrial partner and each euro invested by an academic partner, the government would add two euro. This way they were able to gather a total budget of 300 million, of which 150 million was a subsidy committed by the government. The T in CTMM stands for translations, which means a fast translation of fundamental knowledge from bench to bedside. All this apparently looked quite promising in the eyes of a couple of Dutch health funds, so they added an additional 11 million on top of the 300 million.

At the start two large companies were involved, Philips and Organon (now part of Merck Sharp & Dohme) all others firms involved were SME's. In the business plan that later on formed the basis of CTMM, was specified that the focus would be on four groups of diseases in particular: oncology, cardiovascular diseases, neurodegenerative disorders and infectious and autoimmune diseases, with the emphasis on the first two. An argument to tackle these two largest areas, oncology and cardiovascular diseases, was that they cover 2/3 of all deceased per year in Holland. The focus was on what the effects would be for the affected patients, and of course also the potential savings for national healthcare, if these diseases were diagnosed earlier and 'tailor-made' treatment would be available. So arguments in favor of this approach were seen from the viewpoint of QALY's (Quality-Adjusted Life Year, a measure of disease burden) and economic arguments, so strongly driven from economic viewpoint.

In September 2006 the money was pledged based on the business plan. Next, the first calls were launched in 2007. And finally as from summer 2008 the first projects were launched. The original plan for the projects was they would each take 5 years.

Where do we go from here ?

Heidi recalls "We had no experience at all with managing this kind of projects or consortia. And all of a sudden all these partners showed up, we had barely time to screen them all thoroughly. So when an already formed consortium presented itself, we were more than happy and would tend to leave it as it was for the time being. But of course, they were all assessed afterwards" she adds quickly.

CTMM used what they call 'open calls' (in which consortia could present themselves and their projects) and in total there were three calls in succession. For these calls the framework of the research program was set in advance, it had to be about diagnosis. Also regarding the technology to

be used and studied diseases there were restrictions. In case of CTMM that was ‘early diagnosis and tailor-made treatment’ of above mentioned diseases. The research the projects focus is on translational research (hence the T in CTMM), which means that it helps to make findings from basic science useful for practical applications.

Heidi continues passionately about the projects: ‘We now have 22 projects up and running with around 115 partners in total. All projects differ in size, ranging from 6 to more than 20 partners. The larger projects generally have a lot of partners, often 1 or 2 large industrial firms and several SMEs. There are projects that involve 60 to 80 people, and on the other hand there’s projects that only require 20 people’.

All projects are split up in several ‘work packages’. There is one principal investigator (PI),which is the overall leader. This PI is never a CTMM employee, but almost always assigned by one of the academic partners.’ Heidi remarks that it would have been better if there would have been some PI’s that were assigned by the industrial partners. I ask her in what sense that would be better, to keep the pace in a project ? “No”, Heidi responds, ”because of the involvement. We noticed that it is important for the commitment of our industrial partners that they also contribute. It just works better that way.” She clarifies: ”Let me put it this way, sometimes you can have a company that just puts some money on the table and says ‘now let me in’. Next they just sit back and just watch from the sideline what will happen. But that’s not what we want. What we want is real cooperation, that there’s room for research within the industry and that they have a critical eye for the academic partners. We want to establish real interaction and that the results of one partner is used by another etcetera.”

Heidi believes that if you are involved and do research yourself, that forms a better basis to start from. “And I must say, that’s the case for most partners. Even with the SME’s. They all have their contribution, no matter how small. You just notice it works better when they are closely involved”

The CTMM program-managers participate in most important meeting of the consortia. So at all time they know what going on and what’s playing in the background even when it’s not said out loud. “They just know these things, for example what the sensitivities are when it comes to sharing data or regarding IP etcetera.”

I ask her if it is the task of the program-manager to keep the project up to speed ? “Yes, that’s true, all projects have to report on a regular basis and if the PMs notice it is just window dressing, they have to take action. So yes, they can act as a kind of driver (‘aanjager’) as well, to make sure not to lose focus, avoid inventing the wheel again, etcetera”

Re-inventing the wheel ?

When asked if she had an example or some kind of template she could use when they started CTMM, she responds: ” No, there was not really an example available we could look at. Well, on the other hand there was something like TI Pharma (Top Instituut Pharma), which operated in more or less the same area (i.e. medicines). They started a bit earlier and what we did learn from them was, that before you start you need an IP-model which you can impose on all partners. And also, that you can not negotiate the rules for each consortium. Because then it would take like forever before the first contract would be signed. So indeed in that way, we learned a lot from them. But otherwise, there was not that much we could use, because if you look at their and our industrial partners there's almost no overlap, except Organon. So besides some generalities or general wisdom, like don't take too many partners, there was not that much we could copy as it is a completely different sector and focus.”

The water carriers

Heidi also speaks enthusiastically about her co-workers: “If you see the knowledge that our program managers have gathered, that is very valuable, and of course did not come overnight. What I believe is important, is that the program-managers 'stand on 2 legs'. Let me explain, they all promoted [have a PhD] and conducted academic research for several years. So they know the academic 'culture' and way of thinking; but besides that they also worked in the industry and are familiar with their business culture. These are two totally different worlds, with their own habits. They speak the different 'languages' and understand the 'cultural differences'. The academic world seems to be more theoretically and the business more pragmatic”. Heidi continues: “If you are aware of this as a facilitator, then you are in an excellent position to mediate. Also, when you have to come up with solutions it might be important to know both 'worlds', as that might prove to be important for acceptance.

Partners, in good times and bad

Heidi tells me that companies come up to CTMM and present themselves as potential partners. CTMM then screens them thoroughly, investigates what their contribution could be within a specific project and if the other partners agree. But they have to be aware of the 'competitiveness'. There might already be a competitor involved in the project that might not be too eager to have his competitor joining the project. So there needs to be a kind of 'complementarity'. But otherwise partners have always the possibility to refuse the addition of a new partner. Heidi clarifies: “Companies cannot join a project whenever it suits them. We have guidelines for accessing as well

for termination". CTMM indeed has a quite extended contract that includes all rules related to the consortium. "All these rules were elaborated, before we even signed the first contract."

There was an IP-working group that included representatives of both large and small companies (SME's), as well as people from the UMC's (Universitaire Medische Centra) and all other parties involved. Their task was to develop a balanced model, so the interests of all parties involved were covered. "These IP-rules are the core of the contract" Heidi says. "Besides that, the contract contains numerous other things regarding the working of the projects. For example that every project has a steering committee with representatives of all partners involved, how day to day management of the project looks like, the relation to CTMM, etcetera. So you can see it's all quite complicated", she concludes. To the government CTMM is regarded as the receiver of the subsidies. CTMM in turn, then redistributes the subsidies to the different project partners, based on their work and efforts to the project. "So there's a lot we need to consider, also for example that when a partner violates the subsidy rules and the government demands its money back, CTMM is responsible and we need to sort this out. So that is why it is so important to have all these rules included in the contract."

Now show me some results

The results for some of the initial projects were there almost immediate. Heidi explains: "These projects were already quite advanced when we launched, what probably means one of the partners had an already quite elaborated idea and just needed some additional help and funding to speed up the development.

At CTMM they see it as a good thing to have a nice mix of projects: "Some are at an early research stage and others are more advanced. Some are also straightforward, and show good progress; they often don't involve too many partners. For these projects it's quite clear what needs to be done and who needs to do what. They're clearly outlined and will show result soon. But on the other hand these projects will never show any unexpected results" (serendipity).

They also have projects that are more wide. CTMM does not represent fundamental strategic research, because you already start with some certainties. But even then there's an array of options of where to begin.

"As said earlier, we also have projects that are quite large, with a broad scope and that can be on several tracks altogether. So, the question is, 'will this or that lead to something?' ". She argues: "Then it is necessary that after two years, we test if the project still looks promising and whether to continue or not. Let's call it a litmus test. The progress of these projects will of course be slower than the earlier mentioned more simple projects. But on the other hand there may be more opportunities

and it may offer you wider perspective of outcomes". Then Heidi stresses again, that these are arguments for a healthy mix and variation in projects.

When I wonder if it is possible that after evaluating the project, when it looks like a project leads to nothing, it can be decided to quit or give it to a partner that would like to continue, she replies that there indeed have been some examples of projects where parts of it were halted, however never projects that were fully stopped as a whole. She further clarifies: " it also depends on the size of the projects. Sometimes you get a shift in the project, and then some parts of the research might be terminated and they will focus on the more promising parts. So, occasionally it can happen that part of the research is transferred back to a UMC, so they can do something more fundamental with it. But that is nothing that concerns CTMM, in that case they have to find funding somewhere else."

Sometimes they allow changes to the scope and contents of the projects. When they notice, while reviewing the projects after a couple years, that some things runs good and some don't, it might be worthwhile to focus on the parts that run smooth and look more promising. Of course this then can have a considerable impact on the structure of the project, for example on the funding and on which partner takes care of what. Heidi argues:" In case you wouldn't go through all this hassle, you would have results in the end as well. But it can definitely have a positive effect on the end result".

One of the projects they are particularly proud of at CTMM and is used as their showcase project is the Biochip project. It's a comprehensive diagnostic test to detect two life-threatening types of blood cancer, and was allowed to the European Market in March 2011. On the CTMM website (ctmm.nl) you can find a clip where the CEO of an involved SME explains how it works.

It's all in the contract

The contracts at CTMM are quite extended. Heidi: "Our contracts consist out of 2 parts. The first part has of around 60 pages and is a kind of generic contract that includes all IP rules." All the 'details' regarding the project are included in the second part, the appendices. "The first appendix describes the objectives and all activities. The latter is very detailed, even at task level, to make sure which partner is responsible for which task and which people are allocated to these tasks. The second appendix is about the budget. It mentions how everything is allocated. There's also a connection between the content in appendix 1 and the finances in appendix 2, and so on", Heidi concludes. The projects targets are broken down in half-yearly targets, milestones, and every six months they evaluate if targets have been achieved. The contract also mentions which background IP is brought in and if there are limitations in the use of this background IP, and if any materials is brought in to the project. Normally a contract is somewhere around 200 pages. Every now and then it is necessary to make an amendment to a contract, for example when the scope or content of a projects needs to be updated or when a partner wants to join or leave. In that case the contract needs to be renegotiated, and it takes several months to rework it to include the changes. This is very time consuming and brings a lot of work, which is much overlooked by the government according to Heidi.

During the five year period of a project, it can also happen that employees that were assigned to the project, leave or are replaced. In theory that does not make a difference to CTMM, as all employees work for the partners and not CTMM directly. In the project plan (say the first appendix) is a list of deliverables that need to be achieved after each six months and are evaluated. So it does not really matter if person A or person B does the job. It is the partner itself that organizes this. Heidi adds: "As mentioned before, to us the only thing that matters is the end result. But indeed, every now and then we notice changes in staff, one person leaves, another one joins. But as said the partners have to plan this themselves, we only look at the results". At several times during the interview Heidi will stress the importance of an elaborated contract.

Changes in projects / times are a changin'

It can happen that during the project the number of partners changes, some may come other leave. Targets then need to be changed as well. For example, they had partners that had quite ambitious targets and wanted to deploy on several market and develop divers products, but suddenly realized they could no longer take it financially and needed to focus. If it then happens that their new scope no longer matches with the objectives of the project, there's no longer need for that partner to stay in the project. You cannot expect them to put money in a project for which they get nothing in return. So then they need to go out and look for another partner, which is not easy at all. Because in most of the cases, it is very specific knowledge and they need to find a new potential partner that is willing to take over all obligations regarding both content and finances.

The contract specifies that all partners in the consortium need to agree on hiring or firing a partner. The last thing they want is partners to hop on or off whenever they feel like, because that would mean the whole financing of the project would collapse. So they need the approval of the project's steering committee, which only gives its approval once there is a solution the problem of this partner leaving. So once a problem emerges, in this case a partner wants to get out, the CTMM program manager and the project's management team sit together and look for possible solution and what the options are. Once they come up with a solution, the changes are formalized through an amendment to the contract in which one partner leaves and another agrees to join. "So, it's clear that when a partner suddenly realizes he has no advantage in staying in the project, he can not leave all of a sudden. He signed a contract and that's a commitment', says Heidi firmly.

Importance of CTMM

CTMM takes care of the general program management. Which means that besides all the different managers within a project (the PI, the 'work package'-managers and the project managers who take care of the daily affaires), there is also a CTMM program manager. "This program manager is often seen as a kind of neutral partner", Heidi says. "CTMM is also a contract partner, but of course not a real stakeholder. We do not have the same interests like the industrial and academic partners have. Their interests are pretty clear to everyone. The only interest we have is to make sure the projects show results". Heidi assures me: "We are considered as a neutral partner, with the necessary expertise and competences. It's not enough to screen partners upfront and then to say 'now let's wait for 5 years and see what happens'. You constantly have to do some kind of troubleshooting. Also, because we are working with several small companies, it can always happen that they get for example into financial problems and have to shift their business focus. In that case there are consequences for the whole funding of the consortium, some kind of domino effect. At that moment,

we as CTMM have to come up with a solution." Heidi argues: "So, in case of problems a neutral intermediary with adequate expertise that can come up with solutions is of a crucial importance". She also mentions proudly that the international panel of experts, that participate in the midterm reviews of the projects, repeatedly praised the CTMM program managers. Heidi is convinced this is also because of the fact that they can provide extra 'inside'-information, that can not be found in any written report, but can be important for the assessment. She concludes: "They told me, what the program managers achieve with this, is a crucial factor in optimizing the output".

I ask Heidi if she believes that ideas or projects get further thanks to CTMM, compared to when partners should have worked on their own or through a one-on-one alliance. She nods convincingly, "Yes, I think so. Faster definitely. In some cases I think the project wouldn't even exist. The projects I mentioned earlier, with a narrow scope, few partners and fairly advanced at the beginning (nb when it started as a CTMM project), I believe that even without CTMM they would have taken place. In that case, we just speeded up the delivery of the results. We can say that in that case, indeed it gave an extra impulse and they were able to do more in less time. So it had a positive effect on the time factor. The end results would have been there anyhow, but it just would have taken longer. But we have other examples, where we wouldn't have the results we have today, if there wouldn't have been something like CTMM."

Red tape or necessary evil

CTMM, as program manager, uses a project management system, which is a web-based system. It is a central tool that is accessible to all project's participants.

Each project has its own workspace, which only involved partners can access. It can be used for document management and it also supports the IP-management. Also all the rules that are incorporated in the contract can be found here. "So when they need to check or verify something, they will not have to read through the whole contract, the system can guide them easily", Heidi explains. "For us it is also a check to guarantee we're working in line with what is specified in the contract".

The system is also linked to the budgets. It's a 'closed' system, which means that once the contracts have been signed, it is 'clear' which partners does this, who supplies that, where budgets come from and go to. Everything is clearly specified, so they can not spend more money than the budget that was allocated to that specific project.

The management system is also used for time registration. Every employee needs to log the time he has worked on a project in the database. Weekly work schedules are prepared by the people of the

financial administration, so all people involved in a project receive on a weekly basis their time schedule on which they can log their hours worked. Based on that information, the system generates cost statements. Which in turn can be used by the partner to create invoices, which they can send to CTMM. After verification, the amount due is paid to the partner.

“The advantage is that everything is combined in one system”, argues Heidi, and adds with a smile: “Of course it also has its downsides. For example, the people of the finance department are convinced this is not the most optimal financial system”.

When I say it looks like a lot work and bureaucracy to manage all the administration for 22 projects, and that it almost seems to become the main task for program managers to lead this all in the right direction, Heidi replies evasively: “Of course we tried to automate as much as possible, for example that reports are generated automatically. But of course it stays a horror [‘kriem’]. Definitely because there are so many changes: people on & off, all that has to be monitored, so that the correct person and nobody else can record time spent on the project. Remember, in total there’s about 1000 people working on all project’s combined”.

Location, location, location

CTMM has no central research facility, all research is conducted at the partners’ own facility. “I can imagine that a central location has its advantages, but for us it’s just not feasible. If you look at all the partners working on either one project, it is just impossible to centralize research. On the other hand, it wouldn’t always be useful either, as for example the public partners can be located somewhere at a UMC and you can’t just move them”.

Advantages

One of the biggest advantages of CTMM is that, when you look at the public partners, so many UMC’s are involved. “Before we started with CTMM, that was not obvious”, Heidi clarifies, “back then there were a lot of local ‘kingdoms’, which ‘ruled’ over their own territory. For example, at the Maastricht UMC they did it this way and in Utrecht they did it their way”.

Heidi continues: “Sometimes it can go wrong with very simple things, for example the definition of smoking: how much does a patient smoke ? When you use a different definition, the results are no longer comparable”. Specific to CTMM is they conduct multicenter trials. “They examine patients and take samples, but this needs to be done in a standardized way. So this meant that the way it was done in Maastricht needed to be aligned with how Utrecht did it”.

So, it's important to align the way of working and to gather patient information in the same way, before putting it into a database. This all leads to another advantage, that at the end you get a larger database to retrieve information from and that definitions used are the same everywhere.

At CTMM they experience that when it comes to sharing data, a lot of groups are still reluctant to do this. "You really have to monitor this", reckons Heidi, "when you're not on top of this is, it's just not going to happen. For a researcher his data are very important and valuable, and of course he might not be too eager to share it with everyone."

But that does not seem to be the case with (private) companies. For them it is one of the main reasons to join a consortium: the availability of data. For them that's the way to get their technology validated. And that's why they need the UMC's, because all the data they have gathered. It is understandable that sometimes it's hard to make all your data available and by doing so share all the knowledge you have built up with potential competitors. "But they will have to weigh pros and cons", Heidi summarizes.

Achievements

One of the effects of CTMM is the formation of networks. Heidi sees this as one of the biggest accomplishments: "We think that now partners started working together and teaming up, that will continue afterwards." She specifically mentions the SME's. They organized a poll amongst 56 SME's to find out what according to them was the added value of CTMM. The results were quite positive and show that the SME's felt to be part of a larger network, and that besides the project they were able to join in other things. It gave them a platform, so they could 'surf the wave'.

Heidi says she fears that will change the in the future, when CTMM has ended and now the scientific policy has changed. She believes it will be harder for SME's to get into these networks, although she thinks they will continue to use the contacts and relations that have been built now. She ends with saying that even for large companies it is still attractive to work with SME's, because these SME's often turn up with innovative ideas. "The large companies are more than often happy, that these small ones are joining".

Philosophical reveries

When I ask Heidi if she believes it's really the task of a government to fund this kind of research and to participate in something like CTMM, she vigorously nods: "Yes, I do believe the government needs to make money available". She refers to Mariana Mazzucato, an economist who then recently had visited Holland, who looked at how innovation was promoted and achieved in the US. "Everyone assumes it is the country where entrepreneurship is sacred and the ultimate and everything start with entrepreneurs. But that's not the case, I think. A lot of money is invested by the government to get innovation going. It's really remarkable because the Silicon Valley thing for example, was accomplished through subsidies". She continues: "As a government you first of all need to finance the most risk bearing things yourself, and eventually that will lead to a lot of economic activity which pays itself back." But she does not believe we can expect companies to do this all by themselves. "But, that's what they seem to think in Holland every now and then", she concludes.

Heidi also believes the availability of subsidies definitely has an attraction effect towards companies. "Maybe they feel that what they don't need to put in themselves, they can't lose when things go wrong ? Or less anyway. It's just so that money has a huge binding effect". She continues by saying that you can already see how companies react to the government's new subsidy policy, which is a lot less than it used to be. "You can see that companies think now: 'this subsidy is next to nothing, for that money we are not going through all this. Let's see if there is an easier way to do this, for example if we can do something bilateral'. For example large company with an academic partner. They can find each other quite easy and of course don't need then something like CTMM. If it's just a one-on-one alliance, there's not much that you need. They just do not want what they call 'red tape'".

I ask her when she thinks a construction like CTMM is needed. She answers by saying that is becomes necessary when the consortium gets larger. "When the structure gets more complicated, but that means also there's more potential. It's then you need something like CTMM. In that case it just doesn't go by itself, you know", she argues," Of course when you have a simple a one-on-one, you don't need all this". She concludes by saying that we shouldn't underestimate the multi-disciplinarity and complexity of the projects; they have more potential than a one-on-one that just focuses on one thing. I again mention the 'red tape' that she cited and ask her if she believes that companies go back to one-on-one alliances if there's too much hassle involved. "Definitely if that red tape is not compensated by subsidies", she replies. "Eventually the net effect for a country like Holland will be, despite all subsidies and money invested, definitely worth the money, I believe. It would never ever succeed, when they did not invest the money".

The force is strong with this one

Heidi believes that the strength of CTMM lies in the fact that through the cooperation a focus is created on output. Through this focus you get results and you get them faster.

“But, it surprises our program managers time after time how much effort it takes to bring that focus: we have a clinical need, how do we get to an application”, she says. “It’s also surprising each time how different partners can be. For example UMC’s, they have a certain fundamental theoretical interest, but don’t always have a clear idea how it translate to a specific situation with this kind of patient and that kind of disease. While on the other hand you have the industrial partners who think more concrete/pragmatic. They immediately think: later on I want to see results, a piece of technology that can be sold. So where can we sell it, how many patients are there, how expensive is it, is there a lot of competition, etc ?”.

I ask her if she ever noticed that companies starting working together outside CTMM. “Yes, on several occasions we saw a kind of spin-off, especially with the cardiovascular projects”, Heidi explains ”there are certain consortia, working on heart failure and cardiac arrhythmias, where a certain stability is created. And also, you can see the same consortia that formed within CTMM, are now showing up in the calls of the ‘Hartstichting’. So that’s a nice spin-off, which shows what we have achieved, and has proven to be efficient, and will continue to exist afterwards”, Heidi proudly says, “That is not what we had in mind upfront when we launched CTMM, but it is a nice extra”.

How the relationship is between the larger and smaller partners, I wanted to know. Aren’t companies like Philips for example sometimes too intimidating to SME’s ? “Well, we asked around amongst our industrial partners, face to face and off the record, in the hope to surface what they really expected to get out of the project. That was also to make sure that smaller partners enjoyed some benefits too. It proved to be true indeed, that they don’t always stand up so easy (of course depending on the person). But, we see it as part of our role to make sure everything’s balanced. Because, eventually, it isn’t going to work properly, if one of the partners doesn’t dare to speak out loud and only thinks ‘what on earth am I doing here’. And as a result doesn’t put too much effort in the project. Of course we want to avoid that. We want every partner to benefit from the project”.

If we could start all over

“Well, if we had to start all over, we definitely would take a more critical look (better screening) at what each partner expects to get out of the consortium”. They had cases where the academic partners added other partners to the consortium, just in order to generate more subsidies, as the collaboration of industrial partners was the basis for the subsidies.

So in those projects it was not totally clear what that partner was doing in that consortium, nor what he expected to get in exchange for his contribution. Sometimes that wasn’t even clear for that partner himself. Which soon led to all kinds of difficulties, because when that project was up and running for some time, that partner himself started wondering what he was doing there.

“Of course we also needed this experience first”, Heidi justifies, ”for us it was learning by doing, and of course this was also new to us, we had no experience in this area. Along the way we got a more ‘critical’ look/stance”. But if partners are just dragged into the consortium, it will start to show sooner or later. As soon as that partner realizes he has nothing to gain from this participation, he will want to get out. “Of course, if we had known that upfront, we could have avoided the agony”.

“So I think, we would not allow again to form very large consortia with for example 23 partners”, she says firmly.

What happens next ?

There will be no sequel to CTMM. It was planned originally the projects would take 5 years. Nevertheless, CTMM has now made an agreement with the government to prolong this period. The reasoning behind this is to get to ‘valorization’, meaning: to give an incentive to projects that show promising results. So to give them an extra impulse and push them a bit further towards the market.

“September 2012, we launched an extra, additional ‘valoristation’-call. This was not a real open call, as it was only open for partners of current projects. The selected projects will get an extra 2 to two and a half year with this impulse. The last available money was reserved for these projects and they now have until end 2015 to get to some valorization. But that’s it then, all money is spent now”, Heidi smiles.

In 2012 Holland introduced a new innovation policy, which basically meant a reduction in available funds regarding to Heidi. “The money made available by the government is just a fraction of what it used to be. The TTI-construction was meant to give a kind of impulse and now, in the coming years, we’ll have to see what the results will be and if it was money well spent. All I can say, it’s a pity it now has to end this way”, Heidi concludes.

She also adds she is convinced, that when CTMM ends, all CTMM employees will find another job very soon. As over the years they gathered specific but valuable knowledge.

So, even when all CTMM projects have come to an end, the results have been implemented and CTMM has stopped to exist, it will likely take an additional ten years before we can see the actual results. As CTMM works pre-competitive, it means it takes quite a while before you can find the outcome of the project on the market or at hospitals. Several phase/steps still have to follow.

“In theory CTMM is only involved until phase 2a”, Heide remarks, “which stands for ‘proof of concept’ and means it had proven its efficiency for a small group of patients. After that you still need to conduct large clinical studies, which in turn you need for FDA approval. So once the projects are finalized and after an estimated additional period of ten years, it was calculated it would result in a 1 billion saving for national healthcare. “Which is of course a nice number, if you ask me”, she says smiling.

But they also have examples of projects were the results are already there: a CE label, FDA approval, so already much further as planned by the original target by CTMM. For the outcomes of these projects we do not have to wait an additional years to see the results and impact.

3.3 IMI

In the centre of Brussels, the heart of Europa, you can find the offices of the Innovative Medicines Initiative (IMI). According to their own website it is Europe's largest public-private partnership. Their aim is to improve the drug development process by supporting a more efficient discovery and development of better and safer medicines for patients. They have a budget of 2 billion euro, with which they support collaborative research projects and builds networks of industrial and academic experts in Europe. They act as a neutral third party in creating innovative partnerships and to build a more collaborative ecosystem for pharmaceutical R&D. All this in order to boost innovation in healthcare.

I am sitting together with Hugh Laverty and Magda Gunn, respectively Senior Project Manager and Project Manager at IMI."The whole idea to IMI", Hugh says," was that it was obvious to many, particularly for those in pharmaceutical industry that there are certain problems and certain challenges that they face in terms of understanding disease or regulations, that are confronting everybody in pharmaceutical industries, and that it is no longer possible for one partner or one entity alone to address those"

And that's not only cost-wise. It's also a matter of terms of data you need, understanding disease and the relevance of animal models that they may be using . "We know a lot of animal models don't translate through to humans" Hugh explains, "or companies are just using different animal models."

He continues: "Some companies lack a certain level of understanding of basic processes, or don't have the resources. You have the burdens that regulators want to put on. They worry of safety, so you got an increase in the number of clinical trials. Or patients want a bigger say, they want to know more of the disease. So you can actually see there are coming together many things, and it's just not about money , not just about the science. So the question is: how do you tackle those ?"

Over a period of years the pharmaceutical industry in the form of Efpia entered into discussions with the European commission, and worked out a framework in which they would be able to collaborate. That turned into IMI, a public-private partnership, as where you can bring the different partners together. So companies can work together, or can work together with public academics; the regulators can get involved, patient organizations get involved, with the whole idea of working together to try and translate (3.24) these key challenges and bottlenecks. "As I said single pharma company, a single academic company or a single patient organization can't handle that on their own", Hugh concludes.

Size isn't everything

Although the pharma companies represented in IMI are quite large, and you would expect they can sort everything out on their own, that doesn't seem to be the case. "No, that's true" Magda says. "I think the problem is that they have identified along the drugs development value chain there are many issues and problems. Some are in basic research, some are of them are further into development. But it was not clear where the biggest problems were."

"Not so many good drugs were coming out on the market", Hugh says, "so it looks as if the low hanging fruits, the easy targets, have already been picked. These drugs have already been developed." That means that now they have to tackle the more difficult and more complicated diseases. These diseases don't have one profile and can't be treated with one type of medicine.

Proper tools

Magda explains : "To tackle these difficult and more complicated diseases you need to divide your population and treat them accordingly, it means you need to have tools to define your population. Then you need tools for outcome measures during the clinical trials. You need alternatives to what has been done so far. You need to know are you getting better or worse, but also can you have biomarkers to tell you if the medicine is working or not and if the medicine is safe or not" So, basically tools that will improve the way clinical trials and the drugs development are done.

"It's almost as if the whole system has to be scrapped and start all over again" Magda continues, "to include new modern technologies that we now due to all these scientific advances, like for example the sequencing of human genome". All these new developments, that have happened lets say in the last past 10 years, haven't been fully taken advantage off in the drugs development process, because these new technologies take a lot of research and validation. But also down the road, regulatory agencies have to find a way to classify those tools before they can be used in clinical trials to develop medicine. "So there are different angles to this problem", Magda concludes. "So, as said before one company can't solve it alone , even from the scientifically point of view, and on top you have all the other issues we mentioned."

Hugh adds: "If you look for example at schizophrenia. It's not a single disorder, it's a background disorder. If you want to get an accurate definition of what schizophrenia is, you need well defined populations, well defined phenotypes, well defined genetics, and so on and so. And that's simply not possible with one company on the scale that needs to be done. Because you need a weight of numbers, you need to go beyond the matter analysis."

Advantages

They give examples of what's going on in IMI projects, and where you can see the value of all these people coming together. Magda elaborates: "One company has done 2 or 3 clinical trials on schizophrenia and they have some findings out of that. One the other side you have 5 or 6 companies which all have findings, i.e. separate sets of data that might differ a little in how the clinical trial has done and what the results are. So by taking all these clinical trials together and processing the data, they can be compared against each other. They then can run huge analyses on how the trials where done, what the outcomes were and how they can improve the clinical design. For example, they found that you don't need 79 patients, you only need 46. So that means big savings." They can alter the trial duration, and still get valuable results. Which in turn results into cost savings: less patients, less time, faster development time, etc. These are just one of the things you can look at, besides of the outcome.

Competitors

When I wonder if it doesn't cause problems if competitors need to work together in a project, Hugh doesn't seem to agree: "I think the problem is bigger than just them competing against each other. For example, they can spend billions of euros on developing drugs, and when they finally get to the market there's is an unexpected toxicity issue. Or they spend an enormous amount on getting the drugs to the market and then the buyers say 'actually it's not better than what we had before' and they're are not paying for it. So, it all depends on what you mean by competition. They are competitive and the way the projects are set up respects that in certain areas, so they still compete and still will be trying to get an IP. But those rules apply to the academics and the SME's, they apply to everybody. But the actual challenges that are faced by the industry, mean that in certain areas they are not really competing". Magda picks in :"Or they realize they can't compete anymore, but instead to have to work together. As said before, they realize they can't solve it on their own."

"The groundbreaking thing that is happening here is that they realize themselves they have to work together", Magda concludes. "And of course during projects, depending on work they are sharing, there can be difficulties when to share certain things. As you might know clinical data can be a sensitive issue. For example they wanted to share toxicological info of previous studies and develop a tool for predicting toxicity through computer modeling. But it almost took a year to resolve the legal framework. Eventually this makes it comfortable for everyone to share info".

Data

There is no research conducted at a central location, it all happens in the partners' own laboratories. Occasionally they do exchange researchers; for example researchers from academia go to work in the industry sites. This helps to facilitate the dialogue, especially if they work on the same problem or model.

All data that are put into or come out of a project, are dealt with on an individual project basis. So the info is not completely open to everybody, but only open to all the partners. Within a project you have an academic institution or a neutral third party that holds the database. Also, IMI have them to use the same set up for the database, which makes easier afterwards to put all the data together. "Since IMI started we've gone through a huge evolution", Magda concludes, "In the beginning it was a huge experiment, we didn't know if it was going to work and how it would work, and how to best design it."

Examples / who led the way ?

I ask them if they had an example when they started. "No, not on this scale." Hugh says, "They had to find a way for companies to work together. And also for the European commission to fund the projects in an enormous competitive way. Then had to engage academics, SME's and other different stakeholders"

When I ask what the hardest part was, the presence of SME's or to make the large companies work together, Hugh shrugs and answers: "I don't really know, it really depends on the projects. I'd say it's one of those questions you can find examples all over the projects: in some projects something works well and it doesn't work so well in another project. It just depends on the mix of the companies and the SME's."

Although we are talking about competitive space and a lot of projects we are talking about are competing, a lot of other projects are focused on pre-competitive areas. So we are talking about developing tools, not developing medicines. So when talking about for example biomarkers or an animal model, the companies are very willing to share. Magda explains: "Academics can produce a tool and then they can work together with the companies to adapt the tool for the needs of the companies. So that the tools become useful and applicable for the companies in their drugs development model. Once a model is developed, they use it in their company and test it, and afterwards give feedback: this works well, this doesn't work well, we still need to work on this, etc. So it is kind of pre-validated in a real setting of the pharma company. The collaboration is necessary, otherwise it couldn't have been done. Also it can be published then. And maybe, sometime,

someday, someone will try to use it. And they then will have to spend time again to adapt it to their own needs“. So this close cooperation speeds up the total process. As Hugh explains: “It tries to bring the relevant people and partners together quicker”. “And also prevents”, Magda picks in, ”for different people to work on the same thing independently without talking to each other. It would definitely take much longer to work on the same tool and making the same mistakes, instead of talking together and exchanging experiences”. Hugh continues: “We have examples of companies coming into a project, having looked into their animal models, and say ‘we have tried that, it doesn’t work’. So we got feedback on whether it works or not. It saves time and there’s no waste of effort. We have recurring examples of these things happening.”

Formation

In terms of how the projects are selected and are set up, they have an overarching scientific research agenda. In that it layers out the sort of scientific framework for the area that IMI projects should be addressing. Based upon that the pharmaceutical companies come together and they basically work out where they want to work, what the bottlenecks are; the roadblocks to work on, etcetera. They spend a lot of time working together defining a project. Magda clarifies: “For example they decide to work on diabetes to let’s say stratify patients. They define a problem which usually is not a very focused problem, normally our projects are big in scope and cover. “

In terms of how projects are set up: IMI facilitate to bring the public and private together. Then, once the projects are launched they oversee the management. The day to day management is really to the level of the project. There is a coordinator, that usually comes from pharma, and a management entity, that has responsibility for distributing the budget amongst the public partners. All IMI funding goes to public partners. IMI’s role is just to make sure that the money is spent wisely.

Research agenda

The research agenda sets the framework for the companies and they need to stay within that framework. The original one was very precompetitive, and limited to 4 areas. Now there is more scope in terms of areas, they are more competitive, and much more later stage as well. So there has been a development within the research agenda. The companies use that research agenda. Hugh explains: “4 or 5 companies come together to define the scope what they want to do and who will work on what. They will define the resources they will commit, and then they work on preparing a project outline.”

Partner wanted

The companies are member of Efpia. The research directors group meet each other on regular basis, and one of the items on their agenda is IMI . They bring ideas on what they are thinking of working on. They kind of build the alliances with the other companies that are interested.

Usually there is one company, which interest is the largest or that just decides to take the lead, and that is the so called coordinator. So there's this one person from that company, who is in charge and coordinates with all companies interested. He is mostly involved in developing the text and in communicating with IMI. So from the start it already has some kind of management structure. So IMI doesn't have the lead in the projects, it just facilitates. "We are the enabler, the facilitator", Magda says, "but we do get involved".

Hugh picks in: "The companies involved come to us and talk to us. They have a draft of text of what they want to do. We have a series of steps to go through: first the consultation work shop – we try to get some external scientific input, like good idea, or this is crazy, or it already has been done. So we try to get some independent scientific advice, that sometimes broadens the scope of the project."

Then, once the text is worked on and updated, the consultation exercise goes further. It goes further to our SRG (state representatives group, a body that has representatives in each of the EU states). They have oversight , they can get feedback and talk to their independent scientists on national level. They feed that information back to the scientific committee (independent scientific experts from all over Europe). They have various expertise and they also give feedback. And finally the commission gives feedback. "So it's quite a long process", says Hugh with a smile.

I note that it looks like a lot of bureaucracy. "Not really", Hugh argues, "the commission wants to make sure it is good use of money. The SRT wants to make sure that its public funding, and that we're just not feathering a nest of pharmaceutical companies 'because they have lots of money and they are able to do anything', but they can't ! That's the reality."

Then when the text is finalized, they launch a call. IMI's role is very important in identifying and attracting the public consortia. "We ask for public consortia, usually those who are eligible for funding. So nonprofit patient organizations, academics, SME's. It is well defined In our rules who is eligible for funding.", Hugh explains. They then invite them to submit expressions of interest. The expressions are reviewed by an independent panel of experts. The top ranked consortia will then be invited to join the Efpia consortia. Magda stresses: "To be clear, we don't rank them. We leave that to the panel of experts". They then become a public private consortium, which then produces a full project proposal.

“In the project proposal they are mainly making sure to incorporate what the companies can bring to the table ; is it expertise, is it data, samples, and what the public consortia propose”. Usually the project is divided into work packages. In each package there are representatives from the companies and public consortia members, and they have to work together. They have to ensure that there is a full integration of the interests of the two sides.

SME’s

I ask them what the hardest part is. Finding the SME’s ? Magda explains: ”Well, we don’t find them. Our task is to communicate and advertise. The companies have to find each other. That’s the hardest part, they have to find partners.”

Hugh continues: “It’s always difficult for SME’s to find consortia. They complain a lot. We frequently receive applications, where we see people that clearly haven’t understood what we are doing. They are looking for funding. I always give the advice to SME’s: if you don’t think you can actually commit to the project for 5 years, don’t apply. If you are just looking for funding, there’s lots of other mechanisms. Don’t join IMI as a source of funding. It’s not about the funding, it’s about the collaborative nature and complexity of problems ! Also, SME’s complain a lot because we only reimburse 75% of research cost. We don’t force them to join. The motivation behind why partners want to get involved is important, they might get in with the wrong motivation. So, SME’s are very difficult to get into a project.”

“But sometimes it works very well”, Hugh adds, “sometimes SME’s join because of the great opportunity to network their marker. They want direct access to the large pharma companies and see it as a great opportunity to get in. And even during the project they set up another alliance as well. But of course they have to fulfill the commitment they made and work on the project, they have to live up to their objectives.”

A SME might have a brilliant idea but it might not find the way to get through here. At IMI they realize that’s a problem, and they try to facilitate and bring people together. They have a partner search tool, for the people that don’t already have the network of collaborators, and that are looking for partners. For those people it’s hard because if you don’t know the experts in the field, then it’s very unlikely that they will end up in the IMI project.

Hugh nuances: ” The situation with SME’s has improved a lot since the beginning, as we spend a lot of effort trying to communicate more effectively, so they know what to expect.”

IP

Sometimes SME's are afraid of the IP policy. "They are afraid that others will steel their idea, so they lose their technology". But once the SME's become involved and become more relaxed. They realize it's worth much more to have an effective tools to understand a disease, than to have a patent. Hugh explains: "In many cases SME's have a biomarker, and have patented it, and they suddenly think they have an asset that's worth several millions. They fight and fight, and there's lots of arguments going on in the projects. But for a company it is more valuable to have a tool that works, is worth more than having an IP. On education of the partners, getting them on the speed of the process, we want to make them realize that after 5 years of collaboration, they have an asset that's actually worth something. Because then you have the data that supports it. It's interesting dynamics", Hugh says and continues, "You would assume that the large pharma's would steal everyone's IP. But that's not the case, usually they are the ones the most relaxed about it, because they have it covered or know it's at a pre-competitive stage. They are more focused on having a tool and if there is something they need to license from an academic or an SME, then they will do that ! Because, several billions wasted versus a couple of hundred thousand spent, economically it makes perfect sense, they are not going to fight over that."

Measuring progress

All consortia have to report yearly to IMI. There is a structure for periodic reporting in place, where they have to show what they have accomplished versus what was planned. In the project proposal there are clear milestones an deliverables.

Hugh explains: "It's their progress we follow up. If they miss their timeline, they have to explain why that happened. But there is some flexibility : after discussion with us they can reallocate the budget." In the middle of the project there is also an interim review. Magda continues: "We do definitely keep track of the funds, as they receive funds based on their achievements. They don't receive it upfront". There are different levels of management: scientific management (have they done scientifically and are they doing the things they are supposed to do) and financial management (is it reasonable what they are spending).

An external auditing company is hired by IMI to go to the companies and beneficiaries to look if they are reporting what they are spending and allocating the people as committed. If they made mistakes and reported wrongly, then they have to give the money back. Hugh says: "If you ask me, one of the challenges of IMI is that we have too much of this checking up. I think we sometimes make them feel quite paranoid, because we have audits, audits and audits. Which means a large part of the budget is

spent to see if the budget is spent well. But that's the nature of the beast, those are the rules, although I think it could be improved". Often they hear IMI is too bureaucratic. "A lot of the procedures are bureaucratic, but that's what exist within Europe. Within IMI we're actually quite flexible. If you look at the large companies, there evenly bureaucratic, with so many levels to go through", Hugh argues.

Projects

IMI currently has 40 ongoing projects, with a budget ranging between 25 and 120 million euro. All projects consist of several Efpia members, as well as universities, research organizations, public bodies and non-profit, and SMEs. Projects normally take no longer than 5 year, but if necessary they can request time extension, but no budget extension. Although projects that are already running can apply for additional funding, but for additional activities. For a side project for example.

When I wonder if projects can be terminated early, Hugh replies:" No, none have been terminated early yet." Magda jumps in: "Some time ago we had a project that was only at lets say 10% of its targets after two years, and the governing board was considering to terminate. But they saw the original project plan was to ambitious, so they decided to amend it. If the project was clearly failing it's not worth to continue, they would end it. But it hasn't happen". Hugh picks in again: "Although, it would be interesting to see how we managed that if that should happen. Because we have a legal agreement with public partners to receive funding. So it could maybe become interesting", he concludes with a smile.

Changes in projects

I ask them if it ever happens that a partners want to get out. Hugh confirms: "Yes, especially the pharma's. It happened a few times, but with one large pharma in particular it was most problematic, as they committed to do an important part of the project. But usually it's more a psychological problem; because when a company leaves they project, you start wondering what went wrong."

The pharma companies have more flexibility in whether they can join or leave the project. But if they leave, it could destabilize the project. When I tell him it surprises me that it is the pharma's and not the SMEs as I expected, Hugh clarifies: "The thing that happens most with SME's is that they no longer are SME's. They get bought or they become too big…". "Or they go bankrupt", I fill in, but apparently that hasn't happened yet. If a SME get bought out by a big company, and in that way become an Efpia member, they no longer can receive funding. "Then the project has to go through a whole process of negotiation. We don't remove that partners' funding, the funding can be redistributed, so the public partners can carry on the activities", Hugh says.

“Pharma companies joining projects are more problematic”, Hugh says. They then have to go to negotiations again with all of the partners (that is done by the consortia itself, IMI does not take part in those discussions). When a new partner comes in, everybody has to agree, before you can have an amendment.

In summary, when a partner is joining or leaving, it usually implies a huge amendment. “But it happens quite a lot that new partners are coming in”, Magda says.

If a certain technology or knowledge is not available in the consortia, do they look for an additional partner that has, I ask. Magda replies: ”Yes, they can find people that have the right expertise and then they can do subcontracting”. Hugh continues: “We have third parties, subcontractors, there is a lot of flexibility”. So there can be some extra parties around the network. For example, for a certain project they have generated so much interest, that they have already 35 associated partners. So no real partners of the project, but they have a memorandum of understanding that gives them certain access to certain data. Hugh clarifies: “Our rules are in certain aspect quite strict, but as said we try to give some flexibility to allow this building of networks, and bringing onboard and setting up new collaborations. We are happy to see partners set up new collaborations”.

Magda continues: “If we didn’t allow the partnering, we probably wouldn’t have this much advancement in certain areas. For example also combining IMI, to get larger databases or working together with a US company on data … it would be a pity not to work together”, she concludes.

The early days

Some projects of call 1 already started before IMI existed. They didn’t have anybody to turn to and it as was in the beginning nobody knew what to do. There were a lot of the administrative issues. “Even for getting the money”, Magda explains, ”no IMI, so no money. They couldn’t hire people, what significantly delayed them”. Later on, when IMI was there, everything went smoother; everybody knew what to do and expect. Administrative procedures were made, internet tools were implemented for example for submitting financial reports instead of on paper.

“So, it was learning by doing”, I ask. “Absolutely”, they answer simultaneously.

Accumulated knowledge

I then ask them if they do something with this knowledge they have gathered on how to manage consortia. Magda answers: ”There are plans to launch a next generation of this kind of partnership, so the European commission has launched a review to see what has been accomplished by IMI. And also how the office and all procedures are running. They want to learn what has happened here and if anything needs to be changed or can be made more efficient. All in order to be ready for the next ‘IMI’ “. “And there are also publications coming out, talking about how IMI works, what it is trying to do, etcetera”, Hugh adds.

There are countries all over the world who are interested to see how things are being at IMI (Asian countries, Japan). They want to set up a similar organization, like a public-private partnership. “They have already talked to us, for example on how to design”, Magda says, “Also from the industry perspective, we go to a lot of meetings where people of pharma discuss how pharma is going to collaborate in future. What’s the best framework to do this. Is something like IMI the best ? Should they use licenses and agreements with pharma and small companies? Should they work on bilateral collaboration with the academia? Probably all of the above, depending on the context”, she concludes.

Hugh picks in and says: “Some companies are really progressive. They have lots of different collaborative models, are involved in lot of schemes and mechanisms. But what you see is that the whole industry is looking much more external for its drugs, targets and ideas. The whole business model of pharma is changing. So, for the projects of IMI they are interested in, the IMI model works quite well”. So it depends on the type of target, according to Hugh. If you need for example to get access to a lot of data, a construction like IMI projects would be OK. Otherwise there are other ways possible.

Why IMI ?

Hugh responds firmly: ”Because the way pharmaceutical R&D operated 10 years ago doesn’t work anymore”. Through IMI, companies that are competitors in pharma come together. They work together and learn from each other much faster. Also, the academia and SMEs are changing their mindsets and perception on how pharma works. They learn how to work together more efficiently.

Is that all thanks to IMI, I wonder. “Well”, Magda says, “it makes it possible. It happens also outside IMI, but on a smaller scale. Because it’ so big that we see evolution and change in mindset a lot faster, I think”.

Hugh gives an example of a speaker (of a pharmaceutical company) at a congress he attended, who was convinced that without IMI that work could not have been done. He would not have got access to the people or the information that he needed. He would not have been able to convince his internal management to go on with his work.

“You need a neutral third party, an honest broker, that allows them and gives confidence to bring the data together”, Hugh argues, “You also need a neutral third party to encourage the engagement between the regulators and pharmaceutical companies“. Hugh is on a roll now and concludes: “One of the reasons why the US is so jealous of IMI, is because the culture and the mindset doesn’t exist within the US.”

Also, IMI is incentivizing research where companies would not do research anymore, because financially would not be interesting anymore. In difficult diseases many companies are pulling out, because it is very complex and they have been very unsuccessful, so companies don’t want to do that anymore. Same for rare diseases where for example the population is not big enough, companies say ‘it doesn’t make sense for us’.

So working within IMI incentivizes them, because it lowers the risks, they have to invest less individually. But also on the other side, the benefits from engaging in such a collaboration is huge, because with a fraction of investment they have access to all data, new developments, new tools.

Hugh clarifies: “Antibiotics is a good example. They spend a lot of money developing vaccines or antibiotics. For antibiotics they have to do very complex expensive clinical trials. And if it’s a good antibiotic, it is put in the shelves. Nobody uses it, as nobody wants to start throwing around all these nice new antibiotics, because the bugs will get resistant to them. So they hold them back, and say why are we spending so much money developing antibiotics and generate no revenue ? And if they do generate revenue, it’s quite small because antibiotics are relatively cheap as they are so important. So companies are withdrawing from them. It’s mine to say, you have to find some way of incentivizing them, and that’s by sharing the risk”.

What happens next ?

IMI is supposed to end at 2017 and all projects should have according to plan ended by then, but it could happen due to extensions, that the projects could be taken over by ‘IMI-2’. It’s foreseen under the horizon of 2020, that there will be a new public-private partnership. What form that takes, what the rules will be for the government, that’s all still under discussion. The question is will that be like an ‘IMI-2’ or will it be something completely different ? Will it be a transition or a clean break ?

“It looks like there is going to be a transition in continuum”, Magda says, ” It seems they also want smaller projects, with partners from other industries and going all along the value chain.”

So basically it is expanding. “Based on assessment of current IMI and what’s coming out of the project, it’s suggesting that it is a good model that delivers well and with quite impressive results.”, Magda argues, ”They see it’s worth to keep investing. Both from the commission side (the public side) as from the side of the companies (private side); they’re saying ‘yes we benefit from this and we want to continue this’ “.

Hugh gets the final word and concludes: “I think IMI was set up because of this convergence of societal, economic and pharmaceutical needs. And, as said before, for certain aspects it works quite well; whether it could be applied to everything you want to do, that’s not sure. But in terms of addressing the needs that were identified, then I think it’s a good model that works well”.

4 Analysis

4.1 Introduction

In this next chapter we will analyze our findings from literature and case studies, we will try to find answers on following research questions: Can it be beneficial to use a R&D consortium in order to cooperate, conduct research and promote innovation ? Can a facilitator play an important role in developing R&D consortia and fueling innovation ?

From our literature study we know that there is a 'blind spot' in literature. There is some literature to be found regards R&D consortia, but few proved to be relevant to this thesis. Also, there is next to nothing to find on 'facilitators'. As this is exploratory research the case studies are an ideal way to come to new insights. Eisenhardt (1989) argues: 'one strength of theory building from cases is its likelihood of generating novel theory'.

After we had written the case studies, we listed all remarkable findings from this cases in order to compare it to what we found in literature. We decided to build the analysis around four points that showed important in one or both case studies. These categories are: networks, performance, risk and cost. Besides that we also wanted to focus on mediating factors that can impact the performance of the consortium, namely : subsidies, facilitators and contracts. Besides this some other topics will be handled where I found a link between findings in the cases and literature. Whenever relevant literature was available on these subjects, it will be mentioned in the analysis.

4.2 Open Innovation in consortia

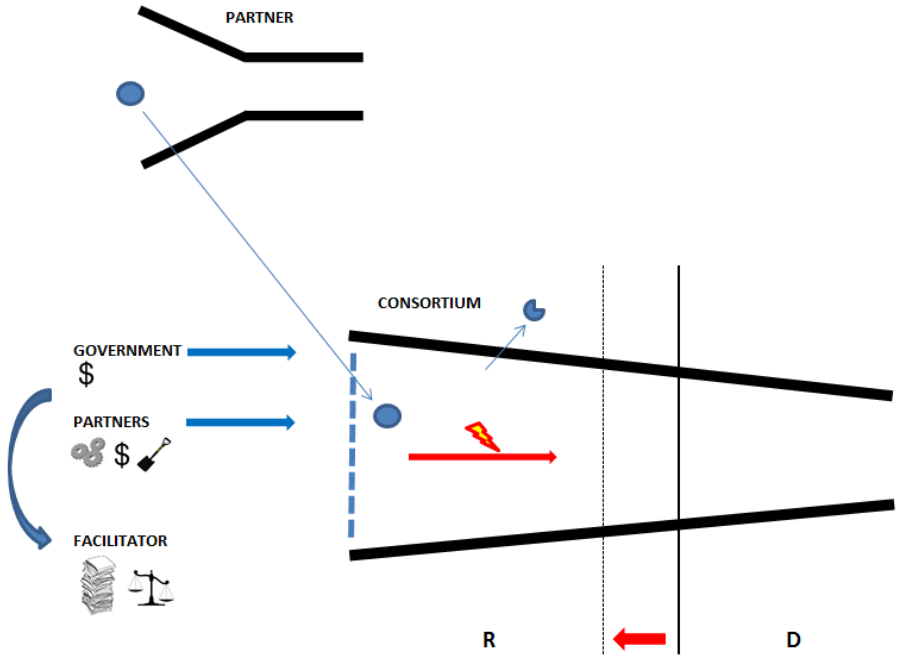

Figure 2 Conceptual model: open innovation in consortia, model adapted from Chesbrough (2003)

This model is derived from the Open Innovation model of Henry Chesbrough (2003). It is my interpretation of how Open Innovation works at the projects/consortia. An idea is transferred from an outside source, like for example from a partner. The ideas are well screened upfront, filtered as you like (dashed line). The sides of this funnel are less steep, as ideas that enter the funnel normally reach the end because they were screened properly at the beginning. It only occasionally happens that a project is (partially) terminated or adjusted, or in the case of CTMM goes back to one of the partners. What we also see in this model, and what will be discussed later on in the analysis, is that ideas move faster though a funnel (represented by the red arrow with lightning bolt). We can also see that the dividing line between research and development moves to the left, as projects move get faster to results. Finally, on the left we can see the 'stakeholders', the work as a kind of lubricant in the funnel. First of all a government, that (co-)initiates the creation of a facilitator and makes a cash contribution. Then all the partners, that invest knowledge, work and money; and finally, the facilitator that takes care of the 'paperwork' and mediation.

4.3 Alliances

4.3.1 Introduction

Through organizations as CTMM and IMI a focus that is created on important issues (research), that otherwise would be overlooked by companies or got lower attention. In the case of IMI that would be for example rare diseases ('no low hanging fruits'). At CTMM we can point at the focus on the most occurring diseases in Holland; so the research is of value for society and national healthcare. For IMI, it is the case that they are not focusing on the results (i.e. producing medicines), but on establishing collaboration and on creating some way of working or routines.

In literature we could find various reasons why to join a multi partner alliance. In Doz et al. (2000) we find the following: similar interests, a triggering entity or open solicitations. In both the case studies we find examples of these three reasons. For 'similar interests' we can give the example of IMI, where the pharma participants want to get better data. The triggering entity is for example Epfia that tries to get the pharma companies to work together.

In Stevens et al. (2013) we find that motives for participation (in their example in precompetitive PPPs) can differ. Academia and public partners focus more on fundamental research, while industry partners focus on development of candidate products. We also saw this in the CTMM case where it was mentioned that academia and industry are two 'different worlds' with different interests. These differences could cause conflicts, but mean also an added value as both sides could have a different view on things.

In literature we could also find several motivations to collaborate in R&D: sharing fixed costs among participants and avoiding 'wasteful duplication' (Sakakibara, 2002). Mothe et al. (2001) also refers to the 'wasteful duplication' and argues that R&D cooperation can eliminate this. The wasteful duplication was also mentioned in the IMI case, where it was said that cooperation on R&D could avoid that two different companies would work on the same disease without knowing from each other. So in total the cooperation would save a lot of money, certainly in an expensive sector like pharma.

Once companies have participated in large-scale R&D consortia, they are motivated for further participation (Sakakibara, 2002). That is what we also heard at CTMM, where consortia that worked together on a CTMM project, present themselves for new projects at other organizations. At IMI they are convinced that through participating in a R&D consortium, you get access to data and new developments and tools, for only a fraction of the amount they would spend if they did it on their own.

CTMM and IMI are public-private partnership, which means they combine skills and knowledge from all kinds of different partners, public (like academia) and private (like SMEs and large companies). On that same theme we found in literature: each member can bring unique resources to the cooperation, such as the deployment of personnel (Mothe et al. 2001), machines or production facilities or technical skills (Browing et al. 1995). This is one of the important aspects of these R&D consortia, the multidisciplinarity. All the different partners bring different skills to the table. In the contracts is well stipulated who brings in what skills and assets.

In summary, CTMM helped to speed up research and helped projects that otherwise would have never been launched. Also, according to the interviewee, thanks to CTMM there's a better focus on cooperation, resulting in faster output. CTMM also brought together two different, separate worlds: the industrial and the academic. They both have a different view on research: the first a more pragmatic, the latter a more fundamental scientific. At IMI they claimed that one company can no longer handle it on its own. And that's not only costwise, but (in pharma) even more about data, understanding diseases and models to use. In the literature Stevens et al. (2013) argue that straightforward collaborative models, such as outsourcing and bilateral contracts, have a proven track record in the pharmaceutical sector. Currently, alternative and more complex collaboration models are being explored. One of the reasons is, according to the interviewees at IMI that there are no more easy targets, or as they called it : all low hanging fruits have been picked. What is left are the rare and complex diseases. New technologies have also surfaced, and regulatory agencies that become stricter. So the problems are on different levels, and that's why one company can handle it on its own. According to literature, an advantage of working in an alliance can be economies of scale.

4.3.2 Network formation

At CTMM they consider network formation as a huge achievement. Thanks to the different consortia at CTMM, companies can find each other and start working together. We saw in the case that without CTMM this would be more difficult. The interviewee also expects that the partners will keep using the established relations and keep working together. Furthermore, a survey held by CTMM showed that the participating SMEs were satisfied with the cooperation, as they felt to be part of a larger network. The interviewee at CTMM also mentioned that she noticed that consortia that formed within CTMM, were showing up in calls elsewhere; that was not what they had originally in mind, but was a nice extra.

In the IMI case we saw that in some projects it can happen that partners sometimes don't have the required knowledge or can use an extra hand. In that case they can call in an external partner,

meaning from outside the projects (for example by subcontracting). That way you get an additional network outside the consortium.

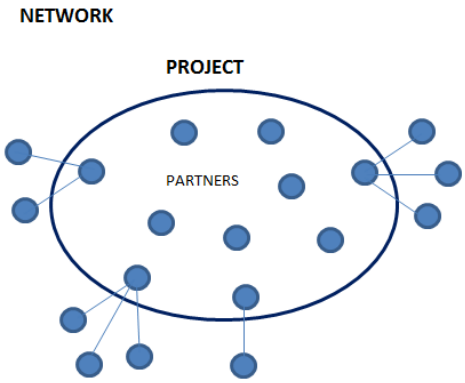

Figure 3 Consortium and outside network

The interviewees at IMI claimed this stimulates further cooperation and creation of new networks, and can accelerate the project. In literature we found several examples where networks and network formation were considered to be important. For example, the network of prior alliances provides information of new alliance opportunities, potential partners and their quality (Kogut et al., 1992). Which could indicate that once companies found each other and are happy with the collaboration, they will continue to collaborate in the future. This was also mentioned in the CTMM case. Gulati (2000) argues that if a partner is satisfied with a third party, he might recommend that third party to other partners. Also the multi partner cooperation provides information about and access to new partners. This is why for example SMEs thought it to be an excellent opportunity to make contact and establish relations.

In research by Stevens et al. (2013), several managers of precompetitive public-private partnerships (PPP) acknowledged the important networking opportunity, and saw new collaborations as a result. Olk and Young (1997) argued that 'network ties were credited with more importance when performance was good'. Again that was the case with SMEs at CTMM; they were happy with the new network ties, so you can expect the projects at CTMM are performing well. Furthermore, Olk and Young (1997) argue that a company may also enter into a consortium considering the future value of additional partnerships with other member organizations. This also showed in both case studies. Also, the more ties an organization has to others in a network, the less likely it is that it will act opportunistically (Provan, 1993). According to Stevens et al. (2013) precompetitive PPPs are a platform for partner scouting, networking, and selections and that the value of these partnerships lies in the opportunity to scout for and network with the best scientists. This argument was also mentioned by the interviewees at IMI. Also, a firm's connection to networks and the number of past

alliances positively influences the propensity of alliance formation (Gulati, 1999). Again, the fact that consortia that formed within CTMM now show up for new projects at another organization, can be seen as an example of that.

4.3.3 Facilitator/mediator/enabler

CTMM program managers are regarded as neutral partners; 'a neutral intermediary with adequate expertise' as the interviewee called it; she also said they as a mediator and are troubleshooting continuously. An example of the troubleshooting she gave, was when a partner get into financial problems, this requires immediate action otherwise it could cause a domino-effect. In literature we saw that effective multi partner alliance management includes a wide variety of elements that managers should be able to recognize and manage. IMI offers help to SMEs during negotiations. Literature also says that in PPPs offer help to SMEs during the negotiations and act as a neutral IP specialist ('honest broker'), which 'facilitates negotiations and IP management in the interests of all parties'. Stevens et al. (2013) also remark that 'SMEs pointed to their lack of experienced IP negotiators and the need for help during IP negotiations' and that 'industry had better lawyers, and the negotiations are all about finding the balance of power'.

Lorenzoni and Lipparini (1999) argue that an active network orchestrator is vital, because having multiple partners may lead to conflicting interests, which stresses the need for a partner who aligns all interests and insures the interest of the collective receives priority above individual interests. Effective network orchestrators foster stability in the group by minimizing internal competition among member firms. Sakakibara (2002) also argues that a government can be an intermediary of information and a facilitator of alliance formation. Both CTMM and IMI are initiated by and partially funded by the government, the Dutch government and the European Commission respectively. The interviewee at CTMM said it was important to be critical in selecting partners before the project begins and suggest to ask all potential partners for their intentions and how they expect to benefit from participating. She gave an example of partners that where just attracted to get additional funding and partners that afterwards started wondering what they were contributing. Partner selection can be an important task for a facilitator. Regarding the number of partners in a consortium, at CTMM it was mentioned that in general a project should not have too many partners, as that increases the complexity significantly. That is in line with what we found in literature, that says each additional member in an alliance adds additional complexity. An increase in partners, increases the need for coordination, as each new partner may increase the chance of conflicting interest between companies in the alliance (Park et al., 1996).

4.3.4 Contracts & IP

The contracts at CTMM are quite extensive. The interviewee said this was to avoid problems later on (better be safe than sorry). The contracts contain two parts: the first part handles IP, the second part all other arrangements like work packages, budgets etc.. The contracts also contain a project plan, with deliverables (milestones) per half year. At IMI they argue that the hardest part is negotiating the contracts. And re-negotiating afterwards if amendments are needed. It is both labor intense and very time consuming. Literature also argues that contracts should better be well elaborated and should pay attention to the value appropriation. And also that there's a need for good agreements with clear definitions, and that good communication, especially related to IP issues, results in good collaboration. Regarding IP, the interviewees at IMI emphasize that a working tool is more important than IP. They say that SMEs sometimes don't seem to realize that. They have an IP and expect it is worth millions. Clear arrangements regarding IP should be made upfront (part of the contract), in order to avoid problems later on according to the interviewee at CTMM. On the other hand, she also mentioned that each project/consortium is different. We found in literature that foreground IP does not cause as many problems during negotiations, as background IP. Which we believe to be understandable as foreground IP is something that still needs to be created and share in that IP can be allocated on participation. Whereas background comes from the partners own 'vaults'; it means they have to 'reveal their secrets' and show it to the other partners. Once you showed it, there's no way back. Also it's hard to compare the value of your background IP, versus that of other partners. Furthermore we read that background IP was the most contentious part of negotiations, so there's a need for good agreements with clear definitions and that 'good communication, especially related to IP issues, results in good collaboration (Stevens et al., 2013). In both case studies we saw that the contracts were well elaborated upfront, so everything was clear. The IP-part is the largest part of the contract, at CTMM we heard even half of a 200 page contract. Also in Stevens et al. (2013) we found lack of trust is related to 'IP hurdles', and that a good and clear IP framework from the start is a proposed solution for the lack of trust. So again, a well elaborated contract can avoid a lot of trouble. In literature we found that clear project management, resulting in for example clear task division and responsibilities, improves communication and lowers opportunism. The interviewee at CTMM demonstrated that all tasks and responsibilities were elaborated upfront in the contract, again to make clear to everyone who needs to do what.

4.3.5 Government and subsidies

The interviewee at CTMM was clearly in favor of government funding for scientific research. She saw benefits for both society and economy. In case of CTMM, it means an additional support for SMEs

and pharma companies. Also, because of this funding we see faster results in research or research that would otherwise never have taken place. Particularly for CTMM it of course has advantages for national healthcare (as explained earlier). In the case of IMI, they argued that the funding by the European commission, did bring additional jobs. They also mentioned that through this funding problems were tackled, that normally would be put aside by pharma companies, for example rare and complicated diseases, few patients, etc. Finally, at IMI they mentioned the fact that pharma companies, although they may be large, can no longer handle it on their own. Money plays an important role and can be a binding factor. The interviewee at CTMM said that companies would like to see a compensation for their work (in the form of a subsidy), and said that with the new upcoming policy regarding subsidies, companies are saying it's not worth the hassle and rather focused on 'bilateral' alliances. She further explained that in that case just one industry partner and one academic partner would work together; they would find each other anyhow. At CTMM they also argued that subsidies in general have an attrition effect. In literature we found an example that seems to be in line. It says that the presence of government subsidies to promote R&D (and an affiliation with a group of companies) enhance the probability that a firm will engage in cooperative R&D (Kleinknecht and Reijnen, 1992). The interviewees at IMI argued that subsidies are useful, because is research is too complicated (rare diseases, few patients) or not interesting regarding revenue (for example antibiotics with a low margin), companies just won't do it. Literature showed that the presence of government subsidies to promote R&D enhanced the probability that a firm would engage in cooperative R&D. So, it looks that although money is important, it is not the most vital requirement. The fact that some organization facilitates cooperation and helps in creating networks is equally important. Also, the fact that the initiative took care of a better data, was considered important.

4.3.6 Data

In both case studies the importance of data was mentioned several times. It is important for researchers to have quality data on hand. As told by the interviewees the projects at both PPPs resulted in better data and data gathering. A downside that was mentioned, is that researchers sometimes are hesitating towards data sharing. Especially at IMI they stressed the importance of good data, for the future and innovation at pharma companies. It depends on the project where data are kept, but generally an academic or neutral third party holds the database. All info is open to partners of that specific project. Avoiding that two partners work on same issue, or that research that has already been done is conducted again, could be found in literature as 'avoiding wasteful duplication' and was called an advantage of cooperation on R&D. Alliances should enhance 'basic

knowledge, pooling of research data, and development of technology platforms' (Stevens et al., 2013). This is exactly what they are aiming for at IMI, and also at CTMM to a lesser extent.

4.3.7 Results

In Stevens et al. (2013) we found the term 'valley of death', meaning 'the situation where risky projects are abandoned because of lack of funds required during extended time periods, rather than because of negative research outcomes'. This is more or less the case at pharma companies. So at the IMI it is mentioned that pharma companies sometimes don't even start a work on a project, not because it's not promising, but because it takes a long time and a lot of money to develop and it might not bring the expected return or profit. At CTMM they proudly said that some projects wouldn't even be there without CTMM, or at least it would have taken longer to get to the same result The interviewee at CTMM stressed that she felt that projects are completed faster; that results are faster visible and can be implemented earlier. Each project is different according to the interviewee at CTMM. At some the scope is wider than at others. She never saw that a project was cancelled as a whole, but it can occur that less promising tracks are left to focus on the more promising parts, or that some 'more fundamental research' is transferred back to a UMC.

4.3.8 Economy and society

In both case studies we saw that some of their activities have an impact on the economy or society. The interviewee at CTMM mentioned that by tackling the top diseases you get economic payback through healthcare. At IMI they said that they have projects that do research on rare diseases, and that without IMI these diseases never would have been investigated. Besides that, investments in R&D can boost economic activity involving skilled labor. As all this is more related to macroeconomics, we did not include this in our literature study.

4.3.9 Miscellaneous topics

4.3.9.1 Difficulties of multi partner alliances

The difficulties, we found in literature, that managers of multi partner alliances can encounter are: free-riding, increased risk of conflicts and, resulting from the previous two, a greater number of partners can lead to additional coordination and communication costs.

The free-riding part, I believe, can be restricted by a good partner selection procedure before the start of a project (as recommended by CTMM). Also, clear and elaborate contract (formal governance), that specifies everyone's obligations and tasks, should strongly reduce free-riding.

Regarding the increased risk of conflicts, what seems inherent to multi partner alliances, I think that both case studies show that a neutral third party that can act as a mediator (like CTMM and IMI) can provide a solution.

The last difficulty, the additional coordination and communication costs related to the greater number of partners, is also inherent to multi partner alliances and difficult to avoid. Again what could be of help, is a neutral third party, that takes care of the coordination and communication to (partially)redeem the partners from this task.

4.3.9.2 Governance

The interviewee at CTMM said she had very few examples upfront, so everything was learning by doing and all needed to be built from scratch. In literature we found that, as a new structure, member organizations have sought effective managerial approaches to consortia. Gomes-Casseres (1996) argues that in multi partner alliances a stronger coordination and network governance is needed than compared to bilateral alliances. For some, this knowledge may have developed through trial and error methods. For others, it has come from learning or copying other experiences – in other consortia or by other member organizations (Olk, 1999).

Regarding governance in alliances two different views can be found in literature: formal governance and social (or relational) governance. From the case studies it show quite clear that IMI has the most formal governance, in my opinion it could be less formal. CTMM seems more moderate, although the formal governance is still strongly present (for example the elaborate contracts).

As said, in literature there are different views regarding governance. Some promote formal governance (Garcia-Canal et al., 2003), which means the use of formalized mechanisms, such as legally binding agreements or contracts. Others are in favor of social or relational governance, which focuses on social mechanisms as for example mutual trust and social commitment (Das et al., 2002; Jones et al., 1997). Some authors are in favor of a combination (Poppo et al., 2002). Goshal et al. (1996) claim that formal governance negatively impacts relational governance, and suggest to prefer social controls. A situation where the basics are arranged by contract, and all other issues by social governance, with a facilitator as referee, seems an ideal combination of both. Das and Teng (1998) and Jones et al. (1997) are in favor of strong social governance for multi partner cooperation, as it is impossible to safeguard every action by formal contracting.

At IMI there are a lot of reports, which can be considered as bureaucracy, as they like to keep track of progress and budgets. They argue that is also because the European Commission wants to know if their money is spent well. The same with audits. At IMI there are a lot of audits. They admit it takes a

large part of the budget, but that's the way the systems works. This can be seen as part of formal governance.

4.3.9.3 Research facilities

Both CTMM and IMI have no central research facilities. In the case of CTMM all research is conducted at the UMCs. The interviewee at CTMM mentioned there used to be a difference in way of working, collecting data and definitions. Thanks to CTMM all these things are now more aligned; as needed for data validity. At IMI they said that although no research was conducted at a central location, an exchange of researchers does takes place. In literature we found a contradiction regarding a central facility. Olk & Young (1997) say US R&D consortia conduct more research at central locations (compared to Japan), while Mothe et al. (2001) argue an R&D consortium through its nature does not possess a centralized or common research facility.

4.3.9.4 Competitors

The presence of competitors in the same consortia was not seen as a huge problem at IMI. They countered by saying there are larger problems, for example that it takes billions to get a drug to the market and sometimes it proves unsuccessful. They conclude the actual challenges of industry lie within non-competitive areas. According to the interviewees at IMI the pharma companies realize they have to cooperate instead of competing and trying to solve everything on their own. Olk (1999) agrees by saying regarding R&D consortia that they have a distinguishing feature, namely their focus on pre-competitive activities. 'Concerns about rivalry, while certainly present, may be lower here than in alliances with the potential for more immediate impact on market competition'. Also, Olk and Young (1997) argue that a company may join a consortium because a competitor has already entered. On the other hand, the likelihood of a member leaving a consortium may increase following a key competitor's departure. In theory, within IMI there can be several competitors within one project (Efpia), but as mentioned before this was not seen as problematic.

4.3.9.5 SMEs

The interviewees at IMI said that SMEs sometimes come to IMI for funding. But they argue that is not the main purpose of IMI, it is all about the collaboration. If they are looking for funding there are other solutions. At IMI they also notice SMEs use their participation in IMI projects to build a network. At CTMM they also indicated there was an good balance between the large and smaller partners; they see it as their task to take care of that balance. I had the feeling that at CTMM they considered SMEs to be important, for example for their original ideas, whereas at IMI I felt this relationship was more 'problematic'.

4.3.9.6 Regulators

At IMI they took the regulators on board as well as partners in the project. In literature (Stevens et al., 2013) we found that participation of such regulatory agencies was considered welcome. In the IMI case the interviewees argued that in pharma new technologies were introduced and the regulatory agencies needed to follow, for example they also needed to create new procedures to evaluate the new products based on that technologies for example. We can see from the perspective of the innovation ecosystem theory; when one of the projects of IMI would get a revolutionary result, it still could be blocked by the regulators, what could be seen as a 'adoption chain risk' (Adner, 2012). They would need to make adaptations to their own procedures and activities as well, so it would be better to have them on board right from the start.

4.3.9.7 Formation processes

In literature we found three types of formation processes (Ring, Doz & Olk, 2005). The process at IMI can be seen as an emergent process, as the pharma companies (represented by Efpia) were experiencing technological challenges and they were pulled together by mutual interests. CTMM on the other hand, can be seen as a result of the engineered process. It was initiated by a triggering entity that saw a need for collaboration. An example of the last formation process, the embedded process, could be the consortia that formed within CTMM and now present themselves as the same alliance in calls from other organizations. They already cooperated, in the meantime developed a steady relationship.

4.3.9.8 Alliance types

In literature (Koza et al.,2000) two types of alliances are distinguished: learning alliances and business alliances. In theory consortia from both CTMM and IMI, can be considered as learning alliances, as their focus is on sharing knowledge and learning. In IMI it was emphasized that the focus was not on the creation of medicine, but on cooperation, data and knowledge. The interviewee at CTMM did make a difference between academic and industrial partners. She said academia are more focused on research (i.e. learning), whereas partners from the industry are more focused on the business aspect (can we sell it and to whom). So, you could say that in the eyes of CTMM, their consortia are a combination of a learning and business alliance.

5 Conclusion

In the previous chapter we compared our findings from the case studies with the ones of the literature study. With that information we have gathered, in this final chapter we now try to answer our research questions: 'Can it be beneficial to use a R&D consortium in order to cooperate, conduct research and promote innovation ?' and 'Can a facilitator play an important role in developing R&D consortia and fueling innovation ?'.

It looks that the success of a R&D consortium is the fact that 1 + 1 proves to be more than 2 when you look at the collaboration on research and innovation in a multi partner alliance. In literature as well as from the case studies it showed that the multi-disciplinarity of the members and the different skills they added to the collaboration are key to the success. A company can no longer believe it has all knowledge in-house, and collaborating in a R&D consortium can bring that it joins different parties that are top in their area of expertise so they can join forces. All this seems to create some kind of leverage that makes collaborating on innovation in a consortium beneficial. Also, thanks to the R&D consortia it looks like a lot of projects were launched that would otherwise never have been initiated, or that firms in that case never would be able to succeed when doing it on their own. It would also like to refer to what in literature is called 'valley of death', meaning the fact that promising projects are put aside because of insufficient funding. Collaborating via a R&D consortium can help to avoid this 'valley of death'.

To formulate and answer to the first research question: '**Can it be beneficial to use a R&D consortium in order to cooperate, conduct research and promote innovation ?**', I would like to use figure 4 you can find below.

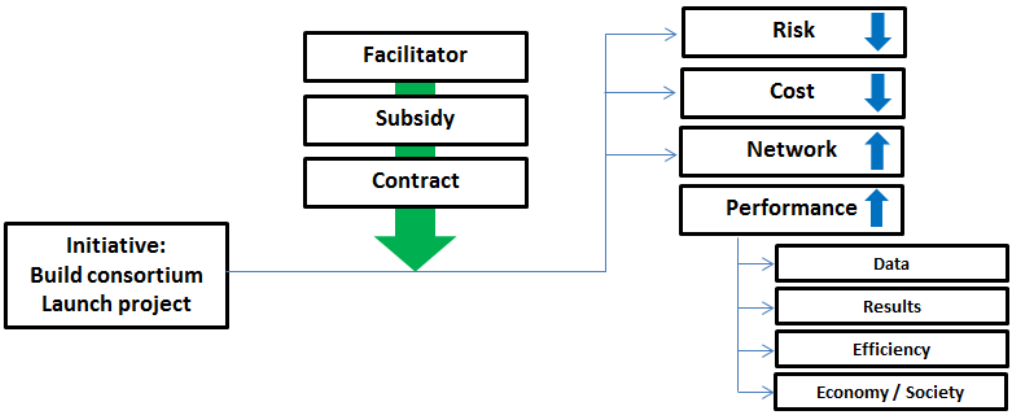

Figure 4 Conceptual model: a consortium's potential results and mediating factors

The figure shows the results that can come from working together in a consortium. These possible advantages can be seen on the right and are: a decrease in risk, lowered costs, creation of networks and relationships and increased 'performances'. These points will be discussed in detail below. In the middle of the figure you can see the factors that can help the consortium to come to these results, let's say the oil that helps the machine to run smoothly. These 'mediating' factors are: a facilitator, i.e. an neutral organization to support the consortium, subsidies and a well elaborated contract. These factors will also be discussed later on.

The first potential advantage is decreasing risk. From literature we know that this is an important reason to join an alliance. In the IMI case study we saw that because of the high risks in pharma development that some companies avoid risky projects because of the uncertain results at the end although the project initially might have looked promising and valid. When collaborating on these risky projects, the risk is spread over different partners and partially takes away the uncertainty.

Lowered costs is a second potential advantage, and can be seen as related to the decreasing risks. In literature we found that companies are facing rising costs and falling R&D budgets. Some comments were made in the case studies, where interviewees referred to rising costs of R&D. Now when companies join forces in a consortium, this can mean that the costs for the same research can be split over different partners, leading to a lower average cost. Furthermore, when investing the same budget in R&D through a collaboration, this would probably yield a larger outcome. Besides this, it's also possible that a consortium is subsidized by a government or other organization. When this happens it automatically leads to a lower cost for the participants, as their costs for R&D will be (partially) refunded.

The next advantage, network creation and the establishing of relationships, was considered very important in the case studies. It is apparently one of the most important reasons why companies, and especially SMEs, join a consortium, the creation of relationships and connections to potential partners. Once such relationships and networks are created and proved to be successful, they can continue to exist for several years even outside the project and outside the consortium. In literature we found also evidence that networks and network ties are very important for consortia and its participants, and is seen as very important by companies. From the findings in the case studies I suspect this to be one of the most important advantages that can come out of collaborating in a R&D consortium.

The final possible advantage, performance, can be seen as a collection of several other, namely: data, results, efficiency and economy/society.

The first one, data, is very specific to the two case studies we handled. For pharma and healthcare companies sufficient and reliable data are key. In the case of IMI, the availability and quality of the data seemed to be the most important result of the cooperation, even more important than the other advantages mentioned earlier. In literature I did not find many information on this. In only one paper we found 'data' was mentioned (Stevens et al., 2013). Not surprising as you know it was about the same type of organizations as we handled in the case studies.

Secondly we have 'results'. By this we mean that results from the collaboration show earlier than what would have been the case when a firm would have done it on its own for example. So, because of combined research efforts, results were available and visible faster. This was mentioned in both case studies, but most emphasized by the interviewee at CTMM. In literature we could find that alliances can lead to better results, but nowhere that this could lead to faster results.

Thirdly we have improved efficiency. This we also could not find in literature, but came out of the case studies. This could mean it's more specific and applicable to the consortia in the case studies, like we saw with 'data' earlier. This does not mean it can't be important to other kinds of consortia as well. By improved efficiency we think of a more uniform way of working and avoiding wasteful duplication. The more uniform way of working was emphasized in the CTMM case. There we saw that they were looking to establish more uniform procedures and definitions regarding the gathering of data. The wasteful duplication was mentioned in the IMI case study. The interviewees gave the example of firms that compare their findings, to make sure that when a certain research has already be conducted, it won't be done again by another partner. A better efficiency in that case leads to cost reduction, according to the interviewees.

Finally, we have the economical and societal impact. We did not look into the literature of this as it is more related to macroeconomics, but we included it anyhow as it showed important in both case studies. If we look for example at the mission statement of CTMM, it says they want to work on the five most common diseases in the Netherlands. The better focus on these diseases will have a serious impact on national healthcare. The broader impact of these two organizations is that they stimulate employment and investment in high-tech areas. And besides that, they can be a 'safe harbour' for SME's and promising start-up companies.

As said earlier there are also factors that can have a mediating effect on the consortium's performance and can help to boost the outcome. First of all, a facilitator, like IMI and CTMM the organizations in our case studies, can play an important role for a R&D consortium. The facilitator can act as a neutral partner during contract negotiations; they can take care of organizational issues and paperwork, including reports and audits; and they can mediate in case of problems or disputes

between partners. In literature we found that a facilitator can play a vital role in formation processes, and that the government could take care of this (Sakakibara, 2002). This is the case in both case studies, where the facilitators are partially funded with government money and assist during the formation processes. The roles a facilitator can play, will be further elaborated below, when we answer our second research question.

The second factor that can be of help is a contract, or formal governance by extension. A clear and well elaborated contract creates stability. It makes sure everyone knows what to expect and is expected of them. A good contract can also avoid possible problems like free-riding (Dyer et al., 2000); it's also important regarding intellectual property (IP). When IP is covered well this is a solid basis for trust, as we saw in literature. Both the necessity of contract and the eventual problems that can occur can be found in literature. So a certain level of formal governance is absolutely necessary, but there should be room for social governance as well, in other words not everything should be put in contracts, as this might limit proper functioning and lead to bureaucracy.

Finally, we saw that subsidies can also have a positive effect on the performance of a R&D consortium. In literature we found that subsidies can engage firms to cooperate in R&D. From the case studies we know that the availability of subsidies has an attrition effect on companies, and can be a motivation for them to join a consortium. On the other hand, we saw in a case study that subsidies are cut back, companies don't think it's worth the hassle to cooperate in larger alliances and fall back to bilateral collaboration. Of course when a consortium gets subsidies, the provider of these subsidies wants to verify that these subsidies are spent well, for example through reporting and auditing. This is where the facilitator, mentioned above, can play a vital role. On a larger scale, the subsidies provided by for example a government, can be earned back over time, for example as we saw with the CTMM case, where tackling the top 5 diseases will cut back the healthcare cost in the future.

I also want to add some concerns I had after making the analysis. Firstly, in some cases I believe too much bureaucracy is involved in managing these consortia. I am referring to all the auditing that was mentioned in one of the case studies, and took a considerable part of the available budget. Secondly, the size of the alliances, meaning the number of partners in the consortium. As we saw, working together in a consortium had its advantages, but at some point there seems to be a tilting point were each additional partner brings more discomfort instead of value. Both in literature as in the case studies we found that it is better not to have too many partners in an alliance.

To summarize, working together in a consortium definitely can have advantages as shown above. Some of the points in the argumentation may not always be applicable and others might be specific

to the consortia in the case studies, like for example the 'data' part. But, I believe we can conclude that it can be beneficial to work in a consortium as this can have a lot of potential upsides. On the other side there can be some pitfalls, like lack of trust and too many bureaucracy.

To answer our second research question **'Can a facilitator play an important role in developing R&D consortia and fueling innovation ?'**, I would like to refer to figure 5 below, that gives an overview of the possible tasks of a facilitator.

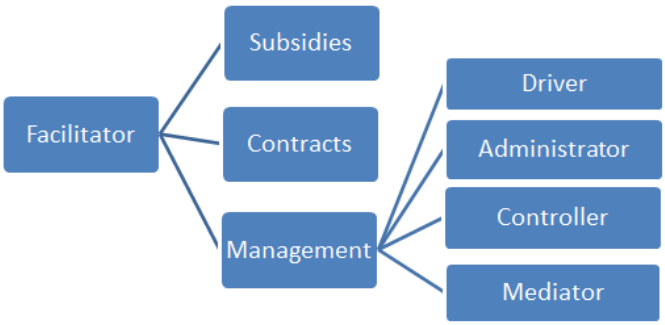

Figure 5 Conceptual model, potential tasks of a facilitator

We found almost no literature regarding facilitators. What we found, said that governments can act as facilitators and facilitators can play a role in alliance formation. In what we 'distilled' from our findings in the case studies, we believe a facilitator can be of use in following cases: subsidies, contract and management. By management we mean overall management and not project management in particular. Also the management part can be further divided in following tasks: driver, administrator, controller and mediator. We will now give some further explanation on these potential tasks.

Firstly, when there are subsidies involved, meaning that project partner can get financial assistance for their work, it looks logical that a neutral party manages and oversees these funds and distributes them to the rightful claimant. A facilitator could take care of this task as neutral party. Secondly, the contracts, prove to be very important for the functioning of a consortium. A facilitator can assist in the elaboration of the contracts. Again, as a neutral party, they can help to assure that through a well elaborated contract all partners benefit from the cooperation and get their fair share, as well assist for example the SMEs that might not have the expertise to negotiate contracts. Finally, there is the management task. As said earlier, not the project management but the overall, organizational management. As we saw in the case studies the actual project management is coordinated by one of

the partners. The first part of that management task is that they can act as a driver. This means they have to make sure the projects keep the pace and stay on track, which can be done via reporting and regular evaluations. Secondly, they can act as an administrator, meaning that they can take care of all the paperwork. For example, as we saw in one of the case studies, they can take care of the logging of hours worked that in turn are used for cost statements. Thirdly, there's the task of controller. They can manage and check budgets, check cost statement and hours worked of partners and monitor progress of the projects. Finally, they can also act as a mediator. Not only when negotiating contracts as we saw earlier, but also in case of problems or when there are disagreements among partners.

To conclude, we believe that a facilitator can mean a considerable support a R&D consortium and can have a significant impact on its performance. Also, in the answer to our previous research question, we found that a facilitator can be a mediating factor to the performance of a consortium. So when playing an important part in supporting a R&D consortium, in that way it helps to boost innovation in the alliance. It seems a facilitator can especially prove to be efficient to control large(r) and more complex alliances, to coordinate different projects with different consortia and to take care of the 'burden' of administration in these consortia.

To summarize, we can respond our research questions positively: it can be beneficial to create a R&D consortium to collaborate on innovation, and a facilitator can contribute to that process. Although we need to remark that this was an exploratory research and little relevant literature was available. We expect this to be subject of more research in coming years.

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