

MASTER

Managing technology commercialization by performing incubator and venture capitalist activities an effectuation perspective

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**Managing technology
commercialization by performing
incubator and venture capitalist
activities**

An effectuation perspective

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This study, with the purpose of obtaining my master's degree, was conducted in the field of Innovation Management and under supervision of the faculty of Industrial Engineering & Innovation Sciences at the Eindhoven University of Technology. It is performed within Company, an organization that creates and develops ventures in order to market new products in the field of medical technology. Since anonymity must be guaranteed, the company name and for that matter the names of all ventures and individuals within Company remain confidential and are replaced by different terminology.

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Management summary

Literature review and research question

Technology commercialization is important for organizations due to its positive impact on competitive advantage (Chen et al., 2011). Technologies are increasingly being commercialized through venturing, whereby the commercializing start-ups experience difficulties related to lack of resources and managerial skills among others (Gans & Stern, 2003). For this reason, research has focused strongly on minimizing the failure rate for new ventures reaching market existence.

Literature suggests that, in order to minimize this failure rate among others, experienced and successful entrepreneurs use the decision-making logic of effectuation (Sarasvathy, 2001), which is discerned from its causal counterpart. Whereas causal logic suggests that decisions are made with preset goals in mind after which the required means are acquired, effectual logic starts with identifying the available means and subsequently forms goals that can be achieved with those means.

Whilst using effectual decision-making might benefit start-ups directly, they can also be assisted in their technology commercialization by getting associated with organizations specifically created for this purpose. Incubators are organizations that provide venture development support (Smilor, 1987; Sherman, 1999), while venture capitalists invest large amounts of capital in new ventures and attempt to increase a venture's future value – and their own profits – by demanding a significant equity share so that they can exert influence within the venture they have invested in (Sahlman, 1990; Barry, 1994). Whereas it has yet been found that effectual decision-making can be beneficial in venturing (Sarasvathy, 2001), it is hardly investigated whether it is being used by organizations engaged in helping start-ups to commercialize their technologies. This study therefore attempts to answer the following research question:

To what extent is effectual decision-making logic being used within organizations that help start-ups to commercialize their technologies?

Research methodology

For the purpose of answering the research question, this study is carried out within Company; an organization engaged in long-term venture development in the medical technology business. Although Company owns the majority of all of its portfolio ventures, daily venture management is left to specific cluster managers so that Company can focus on creating a prosperous environment in which entrepreneurship and venture development can flourish.

Within Company, it is analyzed which technology commercialization activities are being performed and which decision-making logics are employed while doing so. In order to acquire this data, multiple interviews were held with both owners and three cluster managers who are responsible for the majority of the current ventures in development. Moreover, through a moderate form of integration within a Company business case and numerous discussions with an owner and a cluster manager, the level of data collection was enhanced. Based on this data collection, it was analyzed whether an activity was performed by Company. Furthermore, interview results were coded to either causal or effectual logic and to one of the underlying dimension discerning these logics (Read et al., 2009ab) to characterize Company on their employment of both decision-making logics.

Analysis

Results show that Company performs most activities identified in this study as typically related to incubator and venture capitalist organizations, except for the provision of office space for its ventures. The majority of the activities are performed effectually and, more importantly, effectuation can be discerned on all underlying dimensions (Read et al., 2009) whereas causation is only manifested on the basis for action dimension. Further analysis demonstrates that effectual decision-making logic prevails on both incubator and venture capitalist activities. This can be explained by the fact that in most activities – even in VC activities that are usually more associated with controlling ventures (Gompers & Lerner, 2001; Boeker & Wiltbank, 2005) – Company takes a supportive rather than controlling perspective towards their ventures; a perspective that aligns better with effectuation than with causation. Although no link was identified between organization type and decision-making logic, a possible relation was explored when discerning activity types in another way. Whilst activities related to separate ventures and their technology commercialization are performed effectually and with a supportive perspective, activities related to the Company organization as a whole are executed with a causal and controlling approach.

Design

From the results it could be observed that Company has a supportive perspective towards separate ventures when differentiating between them in its coaching, funding, and monitoring them. The aspect identified as the most valuable incubator service area however – the environment of peers that incubates can benefit from (Hansen et al., 2000; Bollingtoft & Ulhoi, 2005) – is merely being controlled by Company. Whereas planned interaction between ventures takes place and also increases knowledge sharing, actively stimulating the formation of an internal and external Company network is lacking. For this reason, this study has created causal and effectual – both decision-making logics are rather complementary than contradictory (Sarasvathy, 2001) and might therefore be beneficial for organizations – approaches that Company could use to become a networked incubator (Hansen et al., 2000; Bollingtoft & Ulhoi, 2005). This should lead to a stronger internal network of Company ventures and to a networked status towards the external environment. Ultimately, this might increase Company name familiarity and subsequently enhance overall technology commercialization.

Conclusions

Although several limitations to this study exist – low number of interviewees, coding being performed by one sole researcher, and making use of certain qualifications of technology commercialization activities while others might have led to other conclusions – contributions are present. It was seen that effectual decision-making is used within organizations engaged in assisting start-ups in their technology commercialization. Moreover, it is the most important decision-making logic considering the widespread character of effectual decision-making. Another contribution is that effectual decision-making logic prevails in both the incubator and venture capitalist activities. This suggests that no relation exists between activity type and decision-making logic and that decision-making logic stems from other aspects present in organizations. Every organization engaged in stimulating technology commercialization by start-ups can therefore adopt, to a certain extent, effectual behavior. Finally, the newly explored relation between activity type and decision-making logic shows that specific incubators manage technology commercialization by supporting their separate ventures effectually while controlling the overall incubator organization causally.

Outline

- 1 Introduction..... 1
- 2 Theoretical background..... 4
 - 2.1 Technology commercialization..... 4
 - 2.2 TC organizations and their activities 4
 - 2.2.1 Incubators..... 5
 - 2.2.2 Venture capitalists..... 7
 - 2.3 Causation and effectuation 8
 - 2.3.1 Basis for action 9
 - 2.3.2 Reaction to environment..... 10
 - 2.3.3 Interaction with others..... 10
 - 2.3.4 Investment rule 10
 - 2.3.5 Summarizing differences between both decision-making logics..... 11
 - 2.4 Technology commercialization related to decision-making..... 11
- 3 Research methodology..... 13
 - 3.1 Study design 13
 - 3.2 Organization 13
 - 3.3 Research plan 15
 - 3.4 Case selection..... 15
 - 3.4.1 Venture A..... 15
 - 3.4.2 Venture B..... 15
 - 3.4.3 Venture C..... 16
 - 3.4.4 Business Case..... 16
 - 3.5 Data collection..... 17
 - 3.6 Data analysis..... 18
 - 3.7 Design 19
 - 3.8 Validity & Reliability 19
- 4 Analysis..... 21
 - 4.1 Minimal engagement in facilities related activities 22
 - 4.2 Both logics present in business assistance related activities 23
 - 4.2.1 Pooled accounting, financial, and legal services performed causally 23
 - 4.2.2 Venture specific activities performed effectually 23
 - 4.2.2.1 Coaching 24
 - 4.2.2.2 Funding or helping ventures to acquire investment capital 24

4.2.2.3	Providing the possibility to obtain legitimacy, visibility, and credibility	25
4.3	Causal approach towards forming an internal network	26
4.3.1	Increasing social inputs through interaction	26
4.3.2	Offering psychological support through team formation	26
4.4	Venture capitalist activities performed effectually.....	27
4.4.1	Monitoring operations and financial performance	27
4.4.2	Changing management.....	28
4.5	Concluding results	29
5	Design	31
5.1	Design opportunities	31
5.2	Requirements	32
5.3	Design solution in literature	33
5.3.1	Networked incubator	33
5.3.2	Company as a networked incubator	33
5.4	Design parameters	34
5.4.1	Office space funding.....	35
5.4.2	Instate networking mechanisms connected to interpersonal relations	36
5.4.2.1	Interaction possibilities	36
5.4.2.2	Synergies between incubates.....	36
5.4.3	Instate networking mechanisms related to incubator construction.....	37
5.4.3.1	Bottom-up approach to incubator management.....	37
5.4.3.2	Variety in incubator members.....	37
5.4.4	Links with external environment.....	37
5.5	Main design	38
5.6	Testing	39
6	Discussion	40
6.1	Contributions.....	40
6.2	Managerial implications	41
6.3	Limitations and future research	42
7	Conclusion	44
	References.....	45
	Appendices	52
	Appendix 1: Interview questions for Company management	52
	Appendix 2: Interview questions for cluster managers	53

Appendix 3: Codification table 54

1 Introduction

Technology commercialization (TC), forming a technology and associated business opportunity into a marketable product or service, has a positive impact on competitive advantage, trade opportunities, and growing living standards (Chen et al., 2011). An important mode of technology commercialization is via venturing where technological entrepreneurs found new ventures around a technological invention and business opportunity (Gans & Stern, 2003). Although technological start-ups have been the most important source of innovation in the past decades (Hayton, 2005; Timmons & Spinelli, 2003), especially commercialization – rather than coming up with the technological inventions – has appeared to be hard for start-ups (Gans & Stern, 2003). Being corroborated by the high failure rate of new ventures found by (Li and Atuahhene-Gima, 2002; O'Shea and Stevens, 1998), conducting research in the area of technology commercialization is worthwhile.

Difficulties in technology commercialization by start-ups are related to uncertainty in acquiring the necessary resources for this process (McMullen & Shepherd, 2006; Venkataraman & Sarasvathy, 2001). A possible way to address this uncertainty has emerged in the context of venturing, identified as an increasingly important TC mode and the TC mode on which the focus lies in this study. Sarasvathy (2001) found that experienced and successful entrepreneurs use effectual decision-making logic in dealing with uncertainty; effectual decision-making logic is contrasted herein with its causal counterpart. Whereas causation logic suggests that individuals make decisions with a preset goal in mind, effectuation logic argues that decision-making is based on the available means with which certain goals can be achieved.

Whilst multiple studies have focused on decision-making logics within start-ups and their corporate counterparts and found that effectual logic was overly used in the uncertain early venture development phases (Brinckman et al., 2010; Sarasvathy, 2008; Read & Sarasvathy, 2005), research on this subject within organizations that help start-ups to commercialize their technologies is scarce. Two well-known organizational archetypes which technological start-ups can turn to for assistance in their technology commercialization are incubators and venture capitalists (Chen et al., 2011). Incubators are organizations designed to assist entrepreneurs in their venture development and growth through providing support in the general areas of technology and management (Smilor, 1987; Sherman, 1999). Venture capitalists invest large amounts of capital in new ventures and attempt to increase a venture's future value – and their own profits – by demanding a significant equity share so that they can exert influence within the venture they have invested in (Sahlman, 1990; Barry, 1994).

Although the employment of effectuation was investigated within venture capitalist organizations in literature (Wiltbank et al., 2009), the focus therein lies on what decision-making logic is used during the selection of ventures to invest in. For example, Chandler et al. (2011) argue that stepwise and experimental investment in new business opportunities according to real options theory (McGrath, 1999) is associated with effectual logic while large immediate investments showcase causal logic. After investment has taken place however, the presence and significance of both logics in general has not been the subject of many studies. Moreover, research that focuses on decision-making approaches within incubator organizations is practically non-existent.

Since effectual decision-making logic employed by entrepreneurs is suggested to be a benefactor in early phase technology commercialization through venturing (Venkataraman & Sarasvathy, 2001), it

is worthwhile to investigate whether this decision-making logic is also being used within organizations that help start-ups to commercialize their technologies. The research question in this study is therefore the following:

Research question: To what extent is effectual decision-making logic being used within organizations that help start-ups to commercialize their technologies?

In order to answer the research question, a case study was performed within Company. This organization creates and develops ventures in order to market new products in the field of medical technology. As the created ventures are in fact Company's product – they attempt to sell the developed ventures to established organizations - venture development and technology commercialization are important business activities within Company. Moreover, ventures' daily operations are attended to by specific venture and cluster managers, so that Company management focuses on creating a fertile business environment for new ventures to prosper in.

Describing Company shows that it possesses characteristics of both venture capitalists and incubators. As the owner of the majority of equity in every venture it has a significant amount of control and is dependent on venture success for its own revenues (VC), and simultaneously it not merely controls ventures but it is actively involved in facilitating every venture's development through providing support (incubator). This hybrid (Battalina & Dorado, 2010) character renders Company as an interesting organization within which to perform this case study.

The remainder of this thesis is as follows. Primarily, a theoretical background is provided that elaborates on the concepts involved in this study and in which the first two sub research questions are answered:

Sub research question 1: What technology commercialization activities are being performed by incubator and venture capitalist organizations?

Sub research question 2: What is the difference between causal and effectual decision-making?

Subsequently, the research methodology is considered in which also Company and three of its ventures are described more elaborately. Hereafter, the results section offers the answers to the following combination of sub research questions:

Sub research question 3: What technology commercialization activities does Company perform?

Sub research question 4: What decision-making approaches does Company use while performing its technology commercialization activities?

Based on the results, a design is created that suggests improvements that might enhance Company's technology commercialization in light of the decision-making logics present within the organization. This design section provides an answer to the practical research question formed in this study:

Practical research question: How to improve technology commercialization within Company in light of their decision-making?

Finally, discussions, limitations and avenues for future research conclude this study.

The objectives of this study are twofold. Academically, it adds to literature the description of a unique organization that manages venture development by other individuals while owning these ventures at the same time in light of their employed decision-making logics. Practically, it provides a possibility to improve venture development and overall technology commercialization by organizations created for this purpose through altering organizational mechanisms.

2 Theoretical background

2.1 Technology commercialization

Technology commercialization is the process of forming a technology and associated business opportunity into a marketable product (Chen et al, 2011). More detailed, it regards the process of acquiring ideas, augmenting them with complementary knowledge, developing and manufacturing saleable goods, and selling the goods in a market (Mitchell & Singh, 1996). Practically, this process commences with product conception, flows through product definition to product pretesting, and is completed by product manufacturing and marketing.

Organizations that are successful in their technology commercialization possess a higher level of TC competence than their less successful counterparts (Nevens et al., 1990). This TC competence, consisting of specific resources and capabilities that determine organizational competence (Barney, 1991; Mahoney, 1995; Teece et al., 1997), refers to organizations being capable of using technologies in products in a wider market range, incorporating a greater breadth of technologies, and realizing faster market introductions. This is necessary in an increasingly quickly changing business environment (Cooper, 2000).

Although commercialization of technologies can take place in several ways – licensing or selling newly developed technologies to large corporations for example (Markman et al., 2008) – commercialization through venture development is focused on in this research. If this takes place, a start-up is founded by individuals around a specific technological invention and a business opportunity. Recently, technological start-ups have contributed vastly to the economy (Drucker, 1985; Hayton, 2005; Kazanjian, 1988). Large majorities of both new jobs and radical innovations have come from entrepreneurial business in the past 25 years (Allen, 1999; Timmons & Spinelli, 2003).

While developing inventions and technologies with commercial potential is not the problem, actually commercializing these is relatively difficult for start-ups (Gans & Stern, 2003). Technology start-ups face greater problems than other firms, including lack of knowledge of the environment, product development experience, and financial resources (Feeser & Willard, 1990; Shan, 1990; Zahra & Covin, 1993), which results in smaller TC competence than established firms (Nevens et al., 1990). Moreover, as these firms have not yet reached market presence they are highly vulnerable and fail easily (Li and Atuahhene-Gima, 2002): less than half of technological start-ups survive for over five years (O'Shea and Stevens, 1998).

For this reason, technology commercialization has increasingly received attention in the academic world. One area on which was focused therein is the involvement of organizations that serve as resource sources for start-ups engaged in technology commercialization (Chen et al., 2011).

2.2 TC organizations and their activities

Two distinct organizational archetypes are engaged in helping start-ups with their technology commercialization by performing several activities and providing resources. Whereas incubators traditionally deliver technological assistance, venture capitalists are more involved in providing financial and managerial resources (Chen et al., 2011).

2.2.1 Incubators

An incubator is an organization type designed to assist entrepreneurs developing a new venture through support in areas of technology and management (Smilor, 1987; Sherman, 1999). Aernoudt (2004) suggests that incubation is a perceived effective way to accelerate growth and development of technological start-ups. Though multiple studies (Allen & Bazan, 1990; Colombo & Delmastro, 2002; Mian, 1996) have investigated the effect of incubator involvement on new venture development and success, results of these studies are inconclusive. Mian (1996) suggests that a university-related business incubator provides value to client firms through university image, laboratories, and equipment among others. Furthermore, Colombo & Delmastro (2002) argue that incubates show higher growth rates and acquire more subsidies than their off-incubator counterparts. The same study however finds that the extent to which innovative activities are carried out is only marginally different between on- and off-incubator firms. Moreover, Allen & Bazan (1990) have found that income and sales growth rates do not differ either.

Historically, incubators are strongly linked to universities because the concept of the incubator was primarily used for enhancing the level of commercialization of university-owned knowledge (Smilor & Gill 1986; Allen & Levine 1986; Mian, 1996). Cooper (1985) however suggests that the role of universities is not overly present within incubator activities and performance. Following through on this merely weak link between incubators and universities, currently a vast amount of different types of incubators exists; both in terms of ownership and organizational purpose. Incubators might either be linked to a university or research institute, to a company or act independently. One level lower, the independent incubator can either be for-profit or non-for-profit (Von Zedtwitz, 2003). Non-for-profit incubators typically have job creation as their goal, among others, while for-profit ones attempt to benefit financially from stimulating the development of new ventures (Becker & Gassman, 2006), either in the form of fees or small equity stakes.

Although the commercial and ownership aspects are often used for classifying different incubator types, other aspects can be used as well. For example, incubators might be involved in specific business areas or take up clients in multiple distinct markets. Also, Smilor & Gill (1986) found that initially incubators were often set up to merely find new alternatives for vacant office spaces that now could generate revenues again. This incubator strategy contrasted with later incubators that were mainly concerned with creating successful new businesses. Altogether, these characteristics lead to an even larger amount of different sorts of incubators, which can ultimately be compared – which will be done in this thesis – in the activities they perform or at least ought to perform according to incubator literature.

Also seen in light of the activities performed, incubators are different; services can include for example the vastly distinct entrepreneurial education (Smilor & Gill, 1986) and providing access to venture capital (Autio & Klofsten, 1998). One study that has provided a clear classification on somewhat more general level is Hansen et al. (2000). This study suggests that an incubator performs the following activities: providing office space, coaching, funding, information technology, public relations, recruiting assistance, legal services, accounting services, pooled buying programs, and – in only 26% of the incubators – an organized internal network. Remarkable is that Hansen et al. (2000) further argue that what discerns the more successful incubator organization from the rest is in fact whether they provide this organized network for incubates. This in turn argues that almost three

quarters of all incubator organizations do not live up to their full potential in assisting start-ups in their technology commercialization.

Integrating the incubator activities identified by Hansen et al. (2000) with another classification (Bollingtoft & Ulhoi, 2005), leads to several alterations and additions. First, it shows that incubators sometimes offer funding themselves but often limit their activities in this area to helping ventures acquire capital externally. Second, information technology is an aspect of the more general office services that incubators provide for their ventures. Third, providing public relations is transformed to the possibility for ventures to obtain legitimacy, visibility, and credibility via the name of the incubator and the network of its management. This can help ventures gain access to outside information, resources and possible partners. Fourth, financial services are added to the incubator activity portfolio. Finally, Bollingtoft & Ulhoi (2005) argue that although an organized internal network is often absent, an incubator organization always creates an environment of peers for its ventures. This helps ventures to receive social inputs, the possibility of resource sharing and psychological support from their peers. Altogether, integrating both classifications leads to the incubator activities classification with three main activity categories depicted in Table 1.

Facilities related activities	Business assistance related activities	Environment of peers related activities
Providing office space	Coaching	Providing social inputs
Possibility of using building facilities	Funding ventures or helping ventures to acquire investment capital	Sharing resources
Providing office services	Providing accounting services	Offering psychological support
	Providing financial services	
	Providing legal services	
	Providing recruitment services	
	Providing pooled buying programs	
	Providing the possibility for ventures to obtain legitimacy, visibility, and credibility	

Table 1: Incubator activities

Facilities related activities consist of providing office space and the services and facilities that are usually associated with offices such as reception, email services and meeting rooms among others. Business assistance related activities help new ventures to focus on their core business while administrative tasks are taken care of. This diminishes costs and time that ventures can now spend on development activities (Lichtenstein & Lyons, 1996; Tornatzky et al., 1996; Von Zedtwitz, 2003; Wolfe et al., 2001). Besides taking over administrative tasks, coaching might help entrepreneurs carry out business activities in the right way and lead them in the strategically right direction. Additionally, helping incubates to acquire venture capital (Autio & Klofsten, 1998), or other types of funding, is seen as business assistance in this classification; as is the case for providing the possibility to obtain legitimacy, visibility, and credibility. Being associated with an incubator organization might lead to a positive word-of-mouth and associated reputation for the new venture (Smilor & Gill, 1986). Finally, the aspects related to the creation of an environment of peers might increase the level of knowledge sharing and resource sharing between incubates (Hansen et al., 2000) of which is argued that it fuels innovation and technology commercialization (Phan et al., 2005).

2.2.2 Venture capitalists

In contrast to incubators, venture capitalist organizations typically limit their activities in light of technology commercialization to financial and managerial ones. Venture capitalists (VCs) acquire and manage a pool of money from investors, and in turn invest in multiple new ventures in different growth stages. Usually, in exchange for their investment they demand a significant equity share and the presence of a board member of their choosing so that they can exert influence on the venture (Sahlman, 1990). After investment has taken place, VCs use this influence through actively participating in the venture's decision-making (Barry, 1994).

VCs typically seek investment opportunities in the form of young and promising entrepreneurial firms (Jain, 2001). As can be seen, funding is a different activity for VCs as it is for incubators. Whereas incubators might provide funding, it can also merely get involved in other forms of support. Contrarily, VCs seal their involvement in a new venture with a large investment, after which other support is provided. Funding ventures is the foundation of VC activity; without investing – VCs make money through these investments – other technology commercialization activities are non-existent. For this reason, funding is not incorporated as a technology commercialization activity performed by venture capitalists in this study.

The activities that venture capitalists perform in order to enhance technology commercialization by their ventures, are often said to be key factors in promoting innovation and economic development (Bygrave & Timmons, 1992). VCs themselves even characterize these activities as just as important as the capital they provide their ventures with (Gompers, 1995). Although research on the relation between VC involvement and new ventures' performance is scarce (Jain, 2001; Sapienza & Gupta, 1994), certain aspects in which venture capitalists are involved have been identified. Before choosing to invest, VCs minimize their investment risk by executing considerable due diligence (Wiltbank, 2005). Target market growth, founders' background and team composition among others are aspects that are analyzed thoroughly before investment (Jensen, 2002; Dileep et al., 1992). Furthermore, often multiple venture capitalist organizations invest in the same venture in order to provide more monitoring control (Wiltbank, 2005).

After having invested – the phase under consideration in this thesis – VCs provide strategic guidance to young technological entrepreneurs. This strategic guidance is based on specialized knowledge about certain markets or growth stages in which their ventures operate (Rock, 1987). This is done with the purpose of increasing the ultimate value that they can reap from a venture's exit (Wiltbank, 2005). Two distinct ways in which VCs participate in their ventures non-financially is by monitoring ventures' operations and financial performance (Gompers & Lerner, 2001) and by initiating changes in venture management (Boeker & Wiltbank, 2005). Placing all non-financial venture capitalist activities identified by Sahlman (1990) in these two categories, leads to the classification depicted in Table 2. One activity, raising additional capital, was omitted in this classification since it is not a distinctive activity compared to the incubator activities identified earlier and therefore does not need to be incorporated in this study.

Monitoring operations and financial performance	Initiating changes in management
Instating board members for monitoring	Changing the actual management team
Helping to define tactics and strategies	Recruiting
Helping to structure transactions	
Taking over day-to-day operations if necessary	
Working with (possible) suppliers and customers	

Table 2: Venture capitalist activities

The most well-known VC activity in the monitoring category is that they instate board members that ensure VC presence and influence in the organization. These board members are however not limited to provide feedback on management decisions, but also actively engage in forming strategies and deal structures. If management is temporarily not capable of performing all daily activities, VC representatives might also take over day-to-day operations or work directly with (possible) suppliers and customers (Sahlman, 1990). In the second category, VCs might add people to the management team or replace – at least strongly advise to – members of the management team. Furthermore, they might recruit specialists in order to improve a specific aspect of the organization’s activities (Leece et al., 2012).

Venture capitalists often find board members, specific expertise from which ventures can benefit (Davis & Stetson, 1981), and subsequent funding (Leece et al., 2012) externally. Although VCs therefore continuously maintain and develop their network, this has not been incorporated as an additional VC technology commercialization activity in this study. The reason for this omission is that the external network was yet considered in the general activity of providing ventures with the possibility of obtaining legitimacy through association with an incubator organization; as this is not theoretically different for incubators and VCs, it is not incorporated separately.

2.3 Causation and effectuation

In light of the concept of venturing, the process that both incubators and VCs attempt to facilitate and improve, it was suggested that certain logic of making decisions is used by experienced entrepreneurs (Sarasvathy, 2001). This logic of effectuation has been discerned from its causal counterpart in light of how to deal with uncertainty, a concept strongly related to technology commercialization (McMullen & Shepherd, 2006). Uncertainty refers to a situation in which future events cannot be foreseen and to which no probabilities of happening can be assigned beforehand (Wu & Knott, 2006). This latter aspect discerns it from risk, where probabilities are known and the only unpredictable aspect is which of the foreseen events will happen in the future.

Causation suggests that every event has its causes and consequences (De Rond & Thietart, 2007; Powell et al., 2006) similar to the laws in natural science (Hume, 1955). Since prediction is important in law-based science, causation similarly tries to lower uncertainty by predicting the *uncertain* future to the highest extent possible. It is therefore often said that causation uses logic of prediction: “*To the extent we predict the future, we can control it*” (Sarasvathy, 2001, p. 252). To predict the future, causation relies on multiple traditional analyses. Hence, a causal decision in venture creation and development is never made before conducting (elements of) a priori market research, segmenting and positioning, and financial and technical analyses.

On the contrary, effectuation suggests that the future is not only uncertain, but that this uncertainty renders the future venture development *unpredictable*. Instead of prediction, effectuation is

therefore formed around the philosophy of working with the inevitable uncertainty and controlling the future (Reymen et al., 2012). The logic that effectuation uses is one of control: *“To the extent that we can control the future, we do not need to predict it”* (Sarasvathy, 2001, p. 252). To control the future, effectual logic suggests the formation of strategic alliances and pre-commitments to certain actions to reduce the detrimental effects of uncertainty. Moreover, flexibility and adaptability are necessary skills in this decision-making logic.

It is clear that the means that causal logic uses are mostly associated with research, analyses and subsequent ‘knowledge’ about the future. Using effectual logic on the other hand makes individuals aware of three main categories of means they possess for the process of decision-making: *who am I, what do I know and whom do I know?* This comes down to their traits, tastes and abilities, the knowledge that they possess, and the social networks they are connected with (Venkataraman & Sarasvathy, 2001). The combination of these three means categories renders certain goals possible to obtain while others lie outside their means. More detailed aspects in which the two logics differ are divided into four dimensions: basis for action, reaction to environment, interaction with others, and the investment rule (Read et al., 2009ab). Both these four aspects, on which will be elaborated below, and the general difference are summarized in Table 3.

	Causation	Effectuation
General difference	Prediction Predict the future to reduce uncertainty	Control Control the future to render prediction unnecessary
Basis for action	Goal oriented Preset goals for which means are subsequently acquired	Means oriented Take means as givens when goals are being formed
Reaction to environment	Avoid contingencies Minimize deviations from initial planning	Leverage contingencies Actively search for contingencies on which changes of plans are based
Interaction with others	Competitive analysis Overly analyzing possible partners and protecting own IP	Partnerships Using many partners easily in product development process
Investment principle	Expected returns Maximize investments to maximize returns associated with success	Affordable loss Merely invest what can be lost, not taking large risks

Table 3: Differences between causal and effectual decision-making (Read et al., 2009ab)

2.3.1 Basis for action

Individuals who make decisions based on causal logic take a specific and preset goal that they want to reach or effect that they want to accomplish as a given. For the enactment of an opportunity, this means that a goal is formulated, after which analyses of competitors, market trends, the environment, and possible competitive advantage are executed. Finally, a strategic plan is set up that must help the firm achieve its preset goal by mobilizing the necessary resources in the right way (Brinckman et al., 2010; Miller & Cardinal, 1994).

While the opposite of this planning approach is often said to be adaptation to the environmental changes, effectuation uses a different concept called exaptation (Dew et al., 2009). Exaptation suggests that effectual approaches transform the available resources by using them in a new matter

instead of in the traditional way. Compared to adaptation, in this case the environment does not ask for the change; the decision-makers merely use resources in an unorthodox way that is expected to create value in the future. In this creation process, effectual logic suggests that the means and resources that can be employed are givens and that the focus lies on possible goals that can be reached or created with these available means (Reymen et al., 2012). Since the goals are unknown beforehand, analyses that try to find the best way to reach them are obsolete and subsequent strategic plans are therefore mostly absent in the effectual logic.

2.3.2 Reaction to environment

The second pillar is strongly associated with the general difference in light of dealing with uncertainty, specifically with unforeseeable individual events in the environment. Whereas causation logic sees unexpected events as interruptions that hinder the execution of strategy and invoke negative reactions, effectuation logic suggests that these events can be used to their advantage. It is therefore that individuals using a causal logic aim to carry out their preset strategy while protecting knowledge from competitors (Garud and Van de Ven, 1992; Van de Ven and Polley, 1992; Choi et al., 2008). On the opposite, effectually oriented individuals actively search for feedback to learn from so that contingencies can be leveraged (Andries and Debackere, 2006; Chandler et al., 2011).

Effectual reasoning even suggests that environmental influences are necessary for ideas to flourish. If one must predict every possibility for an initial idea causally, the chances that exactly this idea will be profitable are often small. If an entrepreneur gradually formulates specific goals and lets his idea be subjected to change, the probability for a similar idea to reach the market is substantially higher (Venkataraman & Sarasvathy, 2001). Moreover, the same study suggests that besides the initial idea, residuals can lead to the creation of completely different markets or products than initially were expected.

2.3.3 Interaction with others

A third difference entails the involvement of other individuals and organizations when acting on an opportunity. Following a causal way of thinking, Read et al. (2009ab) and Walter et al. (in press) argue that every strategic alliance with other firms is analyzed beforehand and is considered only when the business opportunity has already been recognized or created – to protect intellectual property – and product development can be started. The partners are carefully selected based on the complementary competencies to the firm's own so that organizational goals can be fulfilled. Moreover, for every alliance there exists an extensive contract that specifies mutual responsibilities.

In contrast, effectuation already emphasizes the involvement of other people and organizations as committed stakeholders while transforming an idea into an opportunity. These stakeholders not only contribute by increased access to resources and reduced uncertainty; they are in fact actively shaping the goals and the direction for the opportunity (Read et al., 2009ab). Another important contribution of committed stakeholders is the possibility to test new products or services so that feedback can be incorporated early in the process (Reymen et al., 2012). This leads to a less costly product improvement, since necessary changes to the new product are yet identified when only a small amount of costs have been incurred.

2.3.4 Investment rule

Finally, the logics differ with respect to the size and structure of investments sought and made. A causal approach incorporates different scenarios in the business plan and calculates the maximum

expected returns based on those scenarios. The investments that they seek are typically large, so that these maximized returns can be achieved (Reymen et al., 2012). Effectual approaches, on the other hand, do not attach any value to expected returns due to their focus on the unpredictability of the future. Instead of concentrating on maximal potential returns, entrepreneurs using effectuation logic merely consider the assets under control of investors and founders. Investments should therefore never be larger than what any individual or organization does not mind or can afford to lose (Dew et al., 2009). This leads to a 'small step' investment approach (Bhide, 1992) with contributors investing a certain amount that typically grows with decreasing uncertainty and more explicitly defined goals in subsequent steps.

2.3.5 Summarizing differences between both decision-making logics

Whilst the general end goal is basically the same for causal and effectual logic employed in technology commercialization through venturing – an entrepreneur wishes to create a new venture around a business opportunity – the way to get there is different (Sarasvathy, 2001). While causation already specifies the market and product or service of the opportunity and chooses the best means to reach them, effectuation uses feedback from others and the environment to eventually choose the best end product or service and market based on the available means.

2.4 Technology commercialization related to decision-making

Commercializing technologies through the creation and development of a new venture can be characterized as a highly uncertain process (McMullen & Shepherd, 2006; Venkataraman & Sarasvathy, 2001). Both the technical outcomes are unpredictable (Steensma et al., 2000), and the process of market selection and commercialization is subject to uncertainty and ambiguity (Utterback, 1987). Clarity about which (amounts of) resources are necessary is therefore hard to estimate. Moreover, resources and stakeholder support and commitment will be harder to acquire. Nevertheless, Edelman & Yli-Renko (2010) found that a decrease in availability of resources was not directly related to a decrease in entrepreneurial activity. Entrepreneurs rather attempt to use the uncertainty for finding novel solutions for the existing resource constraints. This suggests that in order to overcome problems related to uncertainty in light of resources, entrepreneurs use effectual logic so that they can use that uncertainty to their advantage. Highly uncertain situations might therefore warrant the employment of overly effectual rather than causal logic in decision-making.

Since the early stages of venture development and technology commercialization are associated with the highest level of uncertainty (McMullen & Shepherd, 2006), effectuation might therefore be most useful in these stages. Contributing to this suggestion, Brinckman et al. (2010) found that planning was less effective in small, young firms that often have to deal with more uncertainty. Moreover, Sarasvathy (2008) argues that effectual decision-making and action was used more often in early phases of venture life cycles. Aligned with this argument, Read & Sarasvathy (2005) propose that successful firms more likely start effectual and grow through causal action as they expand. Although Reymen et al. (2012) finds that effectual logic is indeed used more often in early phases of new venture development, it also suggests that, irrespective to development phase, both logics are used simultaneously by entrepreneurs.

Altogether, effectuation might be useful as logic of decision-making by entrepreneurs in early stages of venture development. Incubators or venture capitalists can become involved in the development of individual ventures typically in these early stages. Since these organizations influence, through

provision of support or exertion of control respectively (Sherman, 1999; Sahlman, 1990), venture development, the decision-making logics they employ might be significant for technology commercialization processes. It is therefore proposed that not only venture management’s decision-making logic influences venture development and technology commercialization but that this also holds for the decision-making logic used by incubator or venture capitalist organizations on a higher level. This proposed relation structure is depicted in Figure 1.

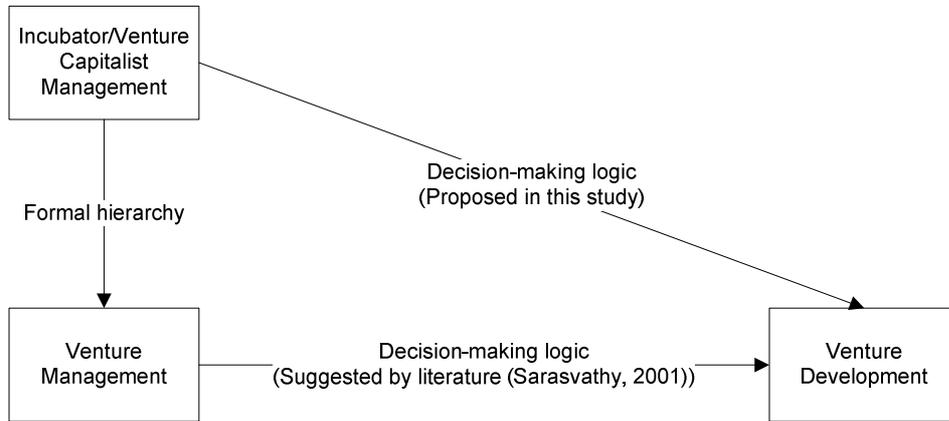


Figure 1: Proposed relation structure

Assuming that this relation structure exist and incubator or venture capitalist decision-making logic influences venture development and technology commercialization, it might be useful to adopt an effectual decision-making approach for these organizations as well. Investigating whether this already is the case, is done with the help of the research methodology provided in the next section.

3 Research methodology

3.1 Study design

Management research should be academically rigorous and practically relevant (Van Aken, 2005) but often this is not the case. Whereas pure academic research excels in rigorous conclusions, it lacks practical relevance (Van Aken, 2004). The reason for this is that academic research is descriptive, explanatory and mono-disciplinary which renders this research inapplicable to specific situations. A possible solution is focusing on solution-oriented knowledge instead of scientific 'truth' (Denyer et al., 2008), following a design science approach (Van Aken, 2005). Being performed in light of actual field problems, design science produces actionable knowledge which is open to validation by other research in comparable situations (Romme, 2003).

In this study, it is attempted to work towards solution-oriented knowledge using this design science approach. Also called science-based design, it starts with organization science which embodies all theories and relations concerned with the concepts present in this study (Romme & Endenburg, 2006). Subsequently, construction principles are created which are similar to technological rules (Van Aken, 2005). These are specific pieces of knowledge that link a certain action to an outcome performed in a specific field and are said to be the products of design science. They can be used as guidelines for managers and as input for validating research. After the construction principles have been made clear, the next step is to form design rules. With the help of these rules, organization practices can be designed and realized. Based on these rules, an organizational design is made, tested, and implemented. After implementation, feedback loops for evaluation ultimately complete the iterative design science process.

Due to time restrictions, I have not performed the complete design science cycle. I have created construction principles and the design rules that follow, on which the organizational design was based. Also, I have provided a possibility for testing the design. Actually performing this testing phase and subsequent implementation and evaluation phases was beyond the scope of this study.

3.2 Organization

Company operates in the growing global healthcare market in which cost-effective solutions must be found in five areas: healthcare prevention, decentralized healthcare delivery, patient self-care, less invasive procedures, and reduction of labor. Having come in touch with two ideas for new products in two of these areas, Owner 1 and Owner 2 decided to found Company in 2009. Following the vision that medical technologies offer the best opportunity to ease the burden of an aging and increasingly chronically ill population on healthcare systems, Company attempts to create and eventually sell successful ventures in the area of medical technology.

Via this process of venture creation, the organization wants to accomplish their mission of bringing breakthrough innovations in medical technology to the market using an entrepreneurial approach that maximizes the chance of success and minimizes risks and costs. Organizational objectives are to build a dynamic portfolio of operationally self-sustaining ventures. Company intends to build and grow value, and associated profits, through majority participations in their ventures and planned exits in the upcoming years.

Since this is associated with certain overhead costs, cash flows must be generated. Company management reasoned that this cash flow would be obtained through increasing the scale and

acceleration of venture creation and development. In turn, this leads to the necessity of a large investment that was thought to come from investor companies or business angels. When it became clear that informal investors supporting the idea – friends of Company – were not that easy to find in the current time of crisis, the only option was to find an investment company. Because these companies are very formal, demand a large share of control, and would judge Company on a certain number of exits per year and return on investment among others, the owners were reluctant to do so.

Instead of selling equity to an investment company, it was chosen to partner up with Owner 3 who has a strong medical knowledge so that the overall management team has received an enormous boost. The money involved with the sale of 33% of the equity can be used as working capital until one of the ventures reaches an exit. Although this money can certainly render as a stepping stone towards subsequent capital inflows, it still is limited. This way of acquiring funding has therefore led Company to ensure that overhead costs are low. Venture managers have been formed into cluster managers, each responsible for a cluster of multiple ventures. This leads to less people in need of future management fees and to communicate with so that less time is spent on this. Moreover, Company will manage one of the clusters themselves, formed around the venture that was already managed by the newly acquired partner.

The core business process is structured as follows. Firstly, opportunities to form new ventures around innovative medical technologies are searched for and selected. Often, these are found within universities and other research institutes that are actively involved in creating new technologies that can be used in the medical world and typically lack the capabilities to valorize these technologies. Corporate companies that do not want to develop new products or research residuals in-house are another source where Company might find business opportunities.

When an opportunity has been chosen to pursue, Company develops a business case on which to base negotiations to acquire the intellectual property associated with the opportunity. Additional negotiations take place with the future cluster manager who is responsible for the cluster in which the to-be-created venture will fit. This cluster manager elaborates on the business case where necessary, after which financing must be sought. A small amount of funding might be provided by Company, but the main part ideally comes from partnerships, subsidies, or other forms of credit. The reason that credit is often searched for in development foundations or in partners that are willing to invest in exchange for future business, is that they typically maintain a lower return on investment standard or operate without it so that the risk involved in investing in the new venture is a smaller inhibiting factor to account for.

With this funding, the proof-of-concept must be developed. This ideally proves the functionality of the idea and its feasibility. Based on this proof-of-concept, a well justified business plan is developed with which additional rounds of funding can be acquired. Usually, second-round funding is needed for the development of the first saleable product, targeted at either the research market or markets for actual medical applications. During this product development phase, the market for the venture itself is being identified or developed. After a market-worthy product has been created that can be sold, Company ideally sells the complete venture; large-scale production and distribution that must lead to a profitable business is to be carried out by established organizations.

3.3 Research plan

Since the activities that are carried out by Company management can be best analyzed within the ventures benefiting from these activities, the venture was taken as unit of analysis. In the next paragraph, the ventures selected for further analysis are identified. By conducting interviews with Company management and cluster managers responsible for these ventures, it was primarily attempted to identify the technology commercialization activities performed by Company. Furthermore, the decision-making logics used by Company while performing its technology commercialization activities were analyzed. Based on these analyses, the prevailing decision-making logic per activity was found and an overall Company characterization in this light was provided. Finally, the study tried to find aspects that Company should improve, using technology commercialization and decision-making literature, interview results, and the writer's opinion. Based on the possible improvements, a design was developed that might ultimately increase Company's technology commercialization success.

3.4 Case selection

While the research methodology was created, Company consisted of two owners and three cluster managers, who together are responsible for three ventures and several business cases. These three ventures and one business case – in which I have performed practical tasks in order to gain a within perspective during this study – are described in this paragraph.

3.4.1 Venture A

The knowledge at the department of computer sciences at Radboud University and the close cooperation with the lung department of the Radboud University Medical Centre created an opportunity for research in the field of Chronic Obstructive Pulmonary Disease (COPD). In a combined effort, subsidies were applied for and acquired to focus the activities on the improvement of self-management by COPD patients through the application of artificial intelligence on the new generation smartphones. It has been the assumption that early detection and warning for symptoms of exacerbation will improve the quality of care for COPD patients, reduce cost of care and improve the quality of life and support healthy ageing.

After Owner 1 had shown interest in the idea, it has been investigated whether the application could be patented by the university. As this was the case, the follow-up selection and evaluation was due. Although the application for subsidies requires many health and process improvements, the potential benefits ensured that the idea received positive feedback and a small grant. Through existing contacts in the network of Company, in the small world of medical technology, Cluster Manager 1 was found as new venture manager. Based on his substantial amount of experience in artificial respiration, and supported by Company, he started writing the Venture A business plan in October 2012. As this was recently completed, the venture is now in the process of submitting for subsidies and other forms of credit. If these are acquired, Venture A can start developing its product. This phase will be managed by Cluster Manager 1 while it will be executed by external parties.

3.4.2 Venture B

Cluster Manager 2, the current cluster manager responsible for the cluster in which Venture B operates, was approached by a United States based company while he was working with the Total Support Group. This United States based company, called BioForce Nanosciences Inc., was working on the development of the ViriChip System, a portable system for the detection and identification of

viruses and virus-like particles. However, they lacked the necessary mechatronic expertise to develop the reader part of that system called the Nanoreader. In addition, BioForce Nanosciences indicated that the Total Support Group should also finance the development of the Nanoreader, since they did not have the financial resources to further support the ViriChip System project. The Total Support Group decided that, as an engineering company, it was not their core business to finance technical development projects.

Cluster Manager 2 was however convinced of the potential of the ViriChip System and started looking for possibilities to finance the project. This is when he came in contact with Owner 1. Company was immediately interested and suggested to take over the complete ViriChip System project from BioForce Nanosciences. Company's owners wrote a proposal to BioForce Nanosciences and in the end, parties signed an exclusive license agreement. The ViriChip System project landed in the Netherlands and a new venture was established by the name of Venture B. After Venture B arranged the first financing in May 2012, the development of the proof-of-concept started. With the support of several development partners in the Netherlands, US and Denmark, this concept was finished at the beginning of 2013. Currently, Venture B is working on a second round of funding for the development of a commercial demonstrator which will initially be sold to the research market. Next step will then be to develop application specific ViriChip Systems for the use in several selected market segments such as the medical and life sciences, bio-defense, food, and veterinary market.

3.4.3 Venture C

This venture combines technologies developed at two universities. Biochemical research from the University of Wageningen and measuring technology from the University of Twente will be combined into a sensor that can monitor the level of a biomarker in the human body. At first the sensor will be able to monitor lactate, which is a more accurate measure than heart rate in light of improving the performance of individuals competing in endurance sports. Future medical applications are monitoring of stress levels because lactate and stress correlate.

Together with both universities, Owner 1 has worked on a project proposal that has been approved in mid-2012 after which Cluster Manager 3 was found for the role of venture manager. This proposal consists of long-term agreements between Company, the universities, and four SME companies that will create the product. Currently, all parties work together towards a proof-of-concept that will show the actual functioning of the sensor. The proof-of-concept is expected by the end of 2013, after which the development of a prototype can start. In 2015, Venture C plans to start developing an actual product for the professional market.

3.4.4 Business Case

When Cluster Manager 2 provided the idea of Venture B, he submitted an additional business opportunity. For a long time, he was thinking about plasma technology and even tried to set up a business with the help of TNO. Since this did not work out, he took it up under the Company name. When the first subsidy for six months of research had to be subscribed for though, Cluster Manager 2 was involved in Venture B so that first a new future venture manager had to be sought. In the last quarter of 2012, Cluster Manager 3 – from this moment on managing both Venture C and Business Case and therefore being the first actual cluster manager – became the new manager of the yet to be created venture Business Case. The money received in the subsidy could be put to use in research within the Eindhoven University of Technology.

Currently, within the confines of this business case Cluster Manager 3 is working on developing a well formed subscription for a follow-up subsidy of the same form. That research money can then be used for further market analysis and initial product development, focusing on the selling propositions of the venture. Increasing the healing of diabetic foot ulcers is the first market to enter with these plasma medicine propositions; other types of wounds and multiple products in which plasma can be integrated are worthwhile to investigate. Moreover, Cluster Manager 3 promotes to form a research institute (D-PARC Dutch Plasma Application Research Center) in order to bundle all activities on medical applications of plasma technology. All future ventures would benefit from the synergy in D-PARC.

3.5 Data collection

In order to depict Company, to formulate research questions, and to create a selection of Company ventures to focus on in this study, multiple initial contact moments were held with Owner 1 and with a managing director that has currently left the organization. Further data that served to acquire a general idea about Company was archival, in the form of business plans and business cases.

Occasionally using this archival data for subsequent data analysis as well ensured, although this was not initially planned, a moderate form of triangulation.

Hereafter, semi-structured interviews were conducted with Owner 2 and the three cluster managers for the purpose of receiving initial information about the technology commercialization activities that are performed by Company. Real-time observations would be preferred to historical perceptions acquired through interviews since these do not lead to retrospective bias (Poole et al., 2000) due to cognitive limitations, lack of crucial information, framing of research questions, and the tendency towards giving socially desirable answers (Huber & Power, 1985; Miller et al., 1997; Schwenk, 1985) among others; using this preferred approach however is too time-consuming in light of the length of this master thesis. For this reason, certain validity and reliability measures have been taken and are considered in paragraph 3.8.

Subsequently, semi-structured follow-up interviews were conducted with the same five individuals – two owners and three cluster managers – as were interviewed in the initial phase. These had an average duration of 75 minutes and were all recorded and literally transcribed afterwards. Their purpose was to corroborate the data about the technology commercialization activities performed by Company and to render decision-making logic analysis possible. The reason for interviewing the same individuals was that there were no other individuals present within Company. Incorporating both owners and cluster managers in this stage had two advantages. Firstly, the information about the activities that Company management says to perform could now be validated within the ventures that are supposed to benefit from the managing activities. Secondly, it has supplied additional insights about technology commercialization activities in which Company is involved.

Both initial and follow-up interviews focused on Company's operations in general, the easily mentionable services it provides ventures with, and its overall interaction with cluster managers rather than on technology commercialization activities as defined in literature. The reason for this is twofold. Firstly, at the time of data collection it was not completely clear whether both Company management and the cluster managers would respond to well-defined technology commercialization activities in interviews since Company was considered a very unique organization possessing characteristics of both incubator and venture capitalist organizations. Secondly, in order to collect as

many results as possible, it was chosen to ask more open questions than straightforward ones about the presence of certain technology commercialization activities. Final versions of the ever changing interview questions for Company management and cluster managers can be seen in appendix 1 and 2 respectively.

Besides conducting interviews with the identified individuals, an additional data source was my embedded observation in the business case selected, Business Case. While performing certain practical tasks therein – engaging in product proposition discussions, supporting exploratory product testing, and conducting initial market research – I was able to directly observe the Company management from outside this venture so that a within perspective was added to data collection.

Not only through observing Business Case from within I have collected additional data, but also through several discussions with Cluster Manager 3 responsible for this business case. Adding to this the numerous contact moments, either or not via Skype, with Owner 1, this led to a continuous data collection rather than one that was specifically related to and bound by the conducted interviews.

3.6 Data analysis

The complete analysis in this study has taken place in a qualitative manner through codifying interview results. All data that was collected in the follow-up interviews was coded to two distinct existing theories rendering the data analysis to follow a template approach (Van Aken et al., 2008). First, all of the specific incubator and venture capitalist services identified in the literature section together served as a framework in which to place the comments made about activities performed by Company (Hansen et al., 2000; Bollingtoft & Ulhøj, 2005). Hereafter it could be decided whether the activities were present within Company or not. If it was not logically possible to place a comment in one of the activities that were identified, additional activities were considered; this however appeared not to be the case.

Second, all comments made were, again if logically possible, coded to either one of the decision-making logics identified in the theoretical background of this study. This was done based on a coding scheme identified and tested for reliability by Reymen et al. (2012), which not only attaches causal or effectual logic to comments but also assigns comments to one of the underlying dimensions discerning both logics: basis for action, reaction to environment, interaction with others, and investment principle (Read et al., 2009ab). Whereas individual comments possessed a sole logic and underlying dimension, this naturally was not the case for overall activities mentioned by multiple distinct comments.

Coding itself took place through assigning three letters to every comment. First, a capital letter N or D was attached for normative and descriptive comments respectively. This distinction between descriptions about a Company activity and normative sketches about a required or wished for situation in the future rendered it possible to use the same data for both analyzing Company and identifying possible improvement areas necessary for the design creation. Second, capital letters C or E stand for a comment possessing causal or effectual logic. Third, one of the capital letters A, E, O, or I were allocated for defining the underlying logic: basis for action (A), reaction to environment (E), interaction with others (O), or investment principle (I). When it was not possible to logically assign a certain decision-making logic to a comment, because the decision itself was not present in it, but the comment itself was important enough to incorporate in the results table, certain comments are

identified as merely descriptive (D) or normative (N). The codification table can be seen in appendix 3.

Finally, it was discerned whether comments were made by either one of the owners or by cluster managers. Since differences between individual cluster managers' comments were not (significantly) present, with the exception of the activity of offering psychological support, these have not been incorporated in the results. Differences in opinion between both owners however, were present; these are specifically manifested by ambiguity about which logic prevails in several activities rather than which activities are performed by Company. These differences in opinion are incorporated and discussed in the results section.

Altogether, these actions have led to the interview results. These served as the basis for the results in the next section and have ultimately led to a prevailing decision-making approach used in every individual activity and an overall Company characterization in this light.

3.7 Design

Using the results from the case study, three opportunities to improve aspects of Company's technology commercialization activities are identified in the design section. Also, requirements have been developed that must be met while creating the organizational design. Taking the improvement opportunities and the requirements into account, a possible solution was provided which is grounded in literature. After describing the concepts present in this solution, it is explained why the solution is appropriate for Company and how it could improve the aspects identified as in need of improvement.

Subsequently, the design parameters of which this solution consists are considered. Hereafter, for every parameter two possible and distinct values were described. Ultimately, by assigning certain values to the parameters, a main design was created that might enhance Company's future technology commercialization success.

3.8 Validity & Reliability

In order to protect the validity and reliability of this study, several measures were taken. Five of them are related to data collection. First, it is guaranteed that the people who are interviewed are knowledgeable about what activities Company performs and in what way this is done. Second, the semi-structured character of the interviews ensured that interviewees did not have to answer questions they do not know the answer to (Miller et al., 1997). Third, as was already said, both Company owners and cluster managers were interviewed to gain multiple perspectives towards technology commercialization activities performed by Company. Fourth, also yet mentioned, a moderate form of triangulation was achieved by using business plans for data collection additional to interview results. Fifth, confidentiality of the interviews is guaranteed so that participants were not afraid to answer honestly (Huber & Power, 1985; Miller et al., 1997).

Overall validity is guaranteed by verifying and discussing results with the Company owners and cluster managers. Besides a continuous iteration with Owner 1 and, to a lesser extent, with Cluster Manager 3, an example of this is that the case descriptions of the selected ventures have been commented on by the responsible cluster managers and altered accordingly. Furthermore, a preliminary presentation for and discussion with individuals involved in Company has corroborated

the results found and has furthermore supplied the necessary additional input for the creation of the ultimate design.

Finally, coding was done on multiple concepts that are grounded in incubator, venture capitalist, and decision-making literature (Hansen et al., 2000; Bollingtoft & Ulhoi, 2005; Sarasvathy, 2001; Read et al., 2009). Moreover, the coding process itself was tested in literature as well (Reymen et al., 2012). This earlier mentioned template approach (Van Aken et al., 2008) is beneficial to both reliability and concept and construct validity.

4 Analysis

This section answers the second pair of sub research questions identified in the introduction of this study. In Table 4 all technology commercialization activities performed by Company are depicted. Moreover, it is shown whether causal or effectual decision-making logic is being used while performing every distinct activity. The abbreviations used for the underlying dimensions discerning both logics are as follows: basis for action (A), reaction to environment (E), interaction with others (O), and investment principle (I).

Overall, it can be seen that both logics are present within Company, but that effectuation logic prevails. Although rays of causal logic are identifiable in how certain administrative services are provided and in how the environment of peers is approached, Company is a relatively clear example of an organization employing effectual decision-making.

In more detail, four aspects catch the eye that are elaborated on in this section: minimal engagement in facilities related activities (4.1), both decision-making logics are present in business assistance related activities (4.2), Company uses an overly causal approach in performing activities related to the environment of peers that Company creates (4.3), and all venture capitalist activities are performed effectually (4.4).

Activity	Causation logic				Effectual logic			
	A	E	O	I	A	E	O	I
Incubator activities								
Facilities related activities (4.1)								
Providing office services								X
Business assistance related activities (4.2)								
Coaching					X			
Funding ventures or helping ventures to acquire investment capital								X
Providing accounting services	X							
Providing financial services	X							
Providing legal services	X							
Providing pooled buying programs	X							
Providing the possibility for ventures to obtain legitimacy, visibility, and credibility					X	X	X	
Environment of peers related activities (4.3)								
Providing social inputs	X							
Offering psychological support	X							
Venture capitalist activities (4.4)								
Monitoring operations and financial performance								
Instating board members for monitoring					X	X		
Helping to define tactics and strategies					X			
Helping to structure transactions					X			
Working with (possible) suppliers and customers						X	X	
Initiating changes in management								
Changing the actual management team					X			
Recruiting							X	

Table 4: Company's technology commercialization activities and decision-making logics

4.1 Minimal engagement in facilities related activities

At the time of writing, Company holds office in the north of the Netherlands at the office of another company owned by Owner 2, but works virtually in general. Cluster managers work from their homes and if they need office services, such as the printing of documents, data shows that they can either use the office in Groningen or pay for those services in their locality and send an invoice to Company. Other services that are provided, but which are not physically related to office space, are for example email addresses and an overall Company website. It was however indicated by cluster managers that server errors should be less frequent and the website should be more up to date among others, in order to reap more benefits from the provided office services.

Other comments on facilities related activities suggest that these are scarce; it was merely said that providing affordable and flexible office space should be taken up in the future – both to stimulate interaction between cluster members and to increase the familiarity with the Company name in the

locality of the office. Since this was argued by both cluster managers and Company management however, expectations are that Company offices will be existent in the near future. With these future offices, cluster managers also acquire the possibility of using building facilities such as shared computers, telephones and receptionist services.

The reason for not investing in physical office space and the associated building facilities is that Company attempts to avoid incurring fixed costs to a large extent. Ventures must first be funded externally before capital can be invested in fixed assets. That way, working capital is present to finance these assets so that ventures and Company as a whole do not go bankrupt when cash inflows are delayed and rents cannot be paid. The avoidance of incurring fixed costs to finance facilities in early development phases shows effectual logic according to the investment principle: do not make investments that you might not be able to afford in the future.

Noteworthy is that Company does not only minimize its burn-rate – fixed costs that often steer new ventures bankrupt since they cannot generate enough cash in early phases – by not investing in office space but also in different ways. For example, no personnel are employed in order to avoid paying taxes and health care costs in this area; everyone involved has its own ‘company’ to which invoices can be sent. Furthermore, all cluster managers invest a certain amount of their own time and/or money, in exchange for equity, so that the burn-rate is low but the commitment to Company is high.

4.2 Both logics present in business assistance related activities

4.2.1 Pooled accounting, financial, and legal services performed causally

Interview results show that Company provides administrative services in the financial, accounting and legal areas so that cluster managers can focus purely on development tasks. For example, it arranges email addresses, runs the archive, performs accounting tasks and manages their ventures legally. Also, every venture and its charters and policies are officially created by Company. Although cluster managers are not impressed by Company carrying out these rather standard tasks, it is valued.

Administrative services in the accounting, financial, and legal areas are required by all ventures at all times. Moreover, the content of the services is often very similar for every venture. Therefore, Company attempts to pool these services together while providing them to its ventures. In interviews it can be seen that the way in which Company does this, is via a certain club fee. Company intends to let ventures pay a certain club fee when they are being funded, which entitles ventures to certain administrative services continuously when they are in need of them. The club fee suggests that providing these types of services requires a certain planning and aggregated goal, which suggests a causal approach on the basis for action dimension. Cluster managers however, who have mainly commented on this club fee idea, do not agree with employing causal logic in this area. They would rather have the possibility to only pay for these services when required and acquire them from whomever they want since this might be less expensive.

4.2.2 Venture specific activities performed effectually

Three types of activities that Company performs cannot be pooled for multiple ventures since their content is different for every venture. Since ventures develop differently, their need for coaching,

funding, and obtaining legitimacy is different in both how and when these needs occur. It can be seen that all of these activities are carried out effectually by Company, on multiple dimensions.

4.2.2.1 Coaching

Interview results show that differences of opinion exist between both owners about how to coach cluster managers. Company management partly suggests that it coaches through ensuring a constant goal focus that must keep cluster managers steering venture development in the direction agreed upon earlier. The prevailing opinion that both the other part of management and cluster managers hold however, is that coaching in the form of feedback is performed when asked for whereby management and cluster managers act as discussion partners. Cluster Manager 1 for example quotes: *“Good way of coaching when asked for instead of ensuring continuous goal focus”*. This suggests that Company rather performs their coaching effectually on the basis for action dimension by taking action when this is needed instead of causally coaching directed to a preset goal such as suggested by one part of the Company management.

Two areas in which Company explicitly attempts to provide support are marketing and technical development. Data suggests that Company management is involved in forming the initial product proposition, for both the end user and paying customer. Also, it provides technical support in project management, technical documentation, quality assurance, approbation and patent search among others. However, it was argued by both management and cluster managers that Company provides support in this area on an ad hoc basis when cluster managers ask for it rather than forcing it upon cluster managers. This corroborates the observation of effectual logic on the basis for action dimension.

4.2.2.2 Funding or helping ventures to acquire investment capital

Based on how Company funds its ventures, it is nothing like a venture capitalist organization. Company does not manage a large amount of investment capital so that it simply cannot invest largely in its ventures. According to cluster managers however, not providing funding in especially the early development stages and therefore letting the cluster managers arrange it themselves, inhibits venture development. This might damage the value creation.

Possibly agreeing with this, Company is yet involved in creating funds for its ventures, albeit moderate ones. For example, the capital related to integrating a new partner within Company management can be used as working capital in the near future. As long as an exit or different cash inflow however will not be secured soon, new short-term alternatives must always be searched for since new and developing ventures will remain in need of capital. This constant search requires large amounts of time and energy, which renders the search for large investments useful.

Company currently employs an effectual small-stage investment approach – in seeking outside investors on Company level – in order to avoid making strict financial projections and giving up large amounts of equity and control. However, large investments are often made by organizations basing their investment decisions on maximum returns and specifically set goals. For the purpose of acquiring large inductions of capital on Company level, it might therefore be warranted to opt for a more causal approach. Another disadvantage to the effectual investment principle indicated by cluster managers is that not being engaged in budgeting for venture development from the beginning might have detrimental consequences because arranging extra funding in the middle of the process costs a lot of energy that can be put to better use.

Although Company has some breathing room in its working capital, the philosophy is not to fund ventures but merely to help them acquire funding externally. The effectual approach is demonstrated herein as well, since Company thinks that beginning phases in venture development should be financed by subsidy money wherever possible because this money is acquired freely without ventures having to thoroughly plan their future actions. Since the proof-of-concept phase, in which initial research and feasibility studies are conducted, is usually financed by subsidies and grants, funding for this phase can often be acquired for the Company ventures. Data indeed shows that Company has a strong and large network among subsidy providers throughout the Netherlands so that ventures can certainly benefit from Company in this area. Comments have however indicated that cluster managers can indeed employ Company network for the subsidy search, but that they still have to search for subsidies themselves. It would be more valuable if Company was able to acquire funding as a consortium from which all ventures could benefit.

Whilst subsidies financing the proof-of-concept phase are relatively easy to acquire by Company ventures, this does not hold for second-round funding required for further development after it is concluded that the future product is feasible and potentially profitable. Results show that it appears hard to find this type of external capital. Besides Company's effectual approach of focusing on relatively small investments, both on Company and on venture level, one additional aspect hinders the acquisition of second-round funding. The Company brand and therefore its recognition is still limited to funding providers in the form of subsidies and grants, while second-round funding is often provided by organizations such as investment banks and venture capitalists among others. A boost in the Company name is required to solve this problem.

4.2.2.3 Providing the possibility to obtain legitimacy, visibility, and credibility

Similar to the acquisition of funding, the Company name and brand is generally important for the possibility for ventures to obtain legitimacy, visibility, and credibility. Although Company is getting increasingly recognized and the Company trust mark is steadily developing, management is not actually involved in this. Another aspect that is required to provide ventures with the possibility to obtain legitimacy is having a network in which this can be obtained more easily. In this aspect, Company is involved which is necessary since every single form of expertise required in product and venture development is acquired externally; Company merely consists of overall management and cluster managers who manage venture teams consisting of external parties directly on a lower level.

Following the Company business plans and seeing this corroborated by subsequent data collection, Company maintains and continuously develops its network in order to be able to find good partners, suppliers, investors, additional team members and eventually potential venture buyers. It coordinates relations with and orchestrates activities carried out by knowledge centers that supply business opportunities, entrepreneurs that can become future venture or cluster managers, suppliers that build (parts of) prototypes and final products, and – to a small extent – investors that are needed for second round funding. Although cluster managers argue that this external network still is in need of improvement, they do see that Company indeed attempts to enhance it.

Company approaches its network mainly effectually. This primarily shows on the interaction with others dimension, since interview results show that partners are often sought without analyzing them and easily are integrated yet in product development phases. This was corroborated by my findings within Business Case, in which external experts on many areas are used for input in initial

product propositions and for arranging product testing. Moreover, data shows that the external network is used to steer existing ventures to new or more promising business areas. This shows that Company exploits the, possibly falsifying, information about products in development in order to change them to become profitable; typical effectual behavior on the reaction to environment dimension. Generally, Company acquires all its venture ideas from contacts in its network so that the network is used as an important aspect of its means on which the ultimate goals to achieve are based. This shows effectual logic in this activity on yet another principle, namely basis for action.

4.3 Causal approach towards forming an internal network

Having created an environment of peers by consisting of multiple ventures and cluster managers, renders it possible for ventures to receive social inputs from others, share resources, and being offered psychological support by people struggling with similar issues. Whereas Company is not involved in stimulating the sharing of resources – probably because most resources used are owned by product development partners – management does attempt to increase interaction and team formation that must increase social inputs and psychological support respectively.

4.3.1 Increasing social inputs through interaction

Historically, stimulating interaction has never occupied an important spot on the Company agenda. Recently however, interaction is being stimulated by a number of means. First, a monthly meeting with management and all cluster managers is being held in which status updates on ventures are provided and important issues are being discussed. Second, a monthly Skype call between Company management and each individual cluster manager ensures a deeper interaction between management and each venture. Since these are very recent ideas, they are still in need of certain routine but cluster managers show confidence in this regular interaction. Additionally, daily interaction between management and cluster managers and often among cluster managers is attempted. Since all these activities possess a planning element – periodic interaction – and a goal element – increasing social inputs – one can argue that stimulating interaction within the organization is performed causally on the basis for action dimension.

Although interaction, and the associated knowledge sharing and learning from each other to a lesser extent as well, has definitely been increased recently, it is argued that cluster managers are still merely working together as partners instead of being part of an overall Company team. For this reason, experiences with previous partners, lists with possible investors and solutions found to problems occurred are not automatically shared. Altogether, this suggests that more efficiency and with that a stronger venture development might be achieved by becoming a team with close ties.

4.3.2 Offering psychological support through team formation

Company attempts to stimulate team formation by giving cluster managers, besides a share in ‘their own’ organization, an equity share in the organization as a whole; an important differentiating factor between Company and both incubator and venture capitalist organizations (Hansen et al., 2000). The specific goal of this action, as was seen in the interview results, is to create a larger commitment to Company and to further stimulate interaction and knowledge sharing between cluster managers, because they can now benefit from others’ successes. It appears to be working since Cluster Manager 2 has argued that *“Company is indeed increasingly becoming a team in which all members are focused more on Company as a whole than on their own cluster”*.

Using shares of equity as the means to create a common goal and therefore a stronger team, suggests that certain financial goals have been projected before having made this decision. This in turn shows the presence of causal logic in the basis for action dimension. It is exactly this point that leads to questioning the influence on team formation of this action, since cluster managers strongly believe that team forming takes place effectually. According to Cluster Manager 3, it happens around *“arbitrary information sharing and operating in nearby locations from each other”* rather than through becoming financially aligned with other cluster managers. For this reason it has been argued by two cluster managers that a team within a team is arising. They perceive themselves as members of a team consisting of the three cluster managers operating in the locality of Eindhoven. This situation is strengthened by the fact that Company, for example on its website, lacks to discern between individuals actively involved as cluster managers and individuals that merely perform supporting tasks as third parties. This does not bring clarity about who is involved in Company and therefore part of the Company team.

4.4 Venture capitalist activities performed effectually

4.4.1 Monitoring operations and financial performance

Whereas Company not actually instates board members to monitor its ventures, its owners are the board members. How their monitoring takes place however is, similarly for the coaching activity considered earlier, different for both owners. Partly it is suggested that Company operates causally by arming cluster managers with a vision and continually monitoring whether this vision is followed by strategy and whether actions are executed in this direction. Contrarily however, it is suggested that Company monitors merely on headlines via short updates so that problems are rapidly detected and easily solved. Moreover, strategies are developed by cluster managers without Company providing strict guidelines for these strategies. According to cluster managers the latter resembles the actual situation, which was seen in the quote provided by Cluster Manager 2 that *“cluster managers form vision and strategy on which feedback is given and for which support is provided”*. Therefore it can be argued that a preset goal in monitoring is often absent: monitoring rather tends to take place effectually on the basis for action dimension.

Aligned with this observation, data shows that initiative generally lies with cluster managers, who work autonomous and are solely accountable for daily management and operations. If they however experience problems or need advice, Company attempts to show that cluster managers are not alone by being an experienced discussion partner; a sounding board can always be provided. Although this way of monitoring is to the liking of cluster managers, they do argue that Company might at times be fiercer in deciding whether to continue with business cases and in ensuring that actions that have been agreed upon are carried out rapidly. Moreover, it was commented that Company must take on certain actions instead of letting cluster managers be responsible for every single aspect of daily venture management.

One aspect that receives special attention in the monitoring by Company is that cluster managers must have a strong market focus at all times. Every contact moment between owners and cluster managers consists at least of new developments in possible markets for and the market proposition of ventures' products. Since a continuous market focus leads to immediate adaptation to an ever changing future market, effectuation is demonstrated in this manner as well on the reaction to environment dimension.

Besides in the activities of instating board members for monitoring purposes and helping to define strategies, effectual logic is furthermore demonstrated in ventures' deal making. Although Company as majority owner of every venture is sometimes present when deals with product development parties are being made, cluster managers drive negotiations and discussions. Company can however assist in preparing negotiations if cluster managers require this, which suggests effectual decision-making on the basis for action dimension.

Ultimately, both the results table and especially initial interviews show that Company is continually working with customers interested in buying the developed venture as a whole. The fact that possible customers are involved from the beginning, in order to respond to the markets wishes, shows effectual logic on the reaction to environment and interaction with others dimension. Dealing with suppliers and customers for ventures' products however, is completely left to cluster managers. Similarly, Company usually does not get involved in executing day-to-day operations.

4.4.2 Changing management

Company's business model suggests that it engages in initiating changes in ventures' management. Primarily, the cluster managers responsible for the ventures are always selected by Company. Further in the process, Company is theoretically able to dismiss a cluster manager under conditions that might hamper the continuity of Company; this cluster manager can then be banned from being a shareholder. In practice, according to initial interviews with both owners, when disagreement exists between Company owners and a cluster manager and it regards a minor issue, the cluster manager usually receives the benefit of the doubt and the opportunity of proving management wrong. However, when a major issue is at stake, Company's owners might come to the conclusion of ending the partnership and replacing the cluster manager. As these discussions and possible replacements do not take place based on the achievement on specific plans and projections, but rather based on problems that arbitrarily arise, effectual decision-making prevails on the basis for action dimension.

Since Company does not have employees officially, recruiting is by definition not performed by Company. However, similar actions can certainly be carried out by Company. It has been argued that it is hard to find cluster managers that possess the required knowledge and expertise on both technological and marketing areas. In most cases, cluster managers appear to be very capable in the product development stages of the venture, but lack the capabilities of maintaining a market focus at all times which should make market introduction more effective when it is due. For this reason, Company can suggest or order that cluster managers hire marketing expertise in latter phases of the venture development. This must then however be funded by the venture, and not by Company. Thinking that all required expertise cannot be integrated in one person and that therefore external expertise is necessary for product development is effectual behavior on the interaction with others dimension.

That Company takes its recruiting activity seriously can be seen in the fact that it has created two internal supporting companies in the areas of marketing and technical support. Yet two issues have led to a discussion about whether the existence of these separate companies is justifiable. Since the number of ventures still is quite low, the supporting companies can never be sustained merely by the work they perform for the Company organization. Furthermore, these companies hire the expertise for their activities from third parties. As this can also be done directly by cluster managers, the need for internal supporting companies does not show in the interview results. Whatever the result of the

discussion will be – maintaining the supporting companies integrated in Company or not - knowledge and expertise on both areas are always being acquired externally. Therefore, it corroborated that this activity is carried out effectually on the interaction with others dimension.

4.5 Concluding results

Literature suggests that venture capitalists would perform their technology commercialization activities rather causally while incubators would approach them effectually. This proposition is based on how venture capitalists usually make investment decisions. They typically invest large sums of money to maximize returns, causal on the investment principle dimension, and base their actions on preliminary analyses and preset goals where they can, causal on the basis for action dimension (Sahlman, 1990). Incubators usually do not show this behavior (Hansen et al., 2000). If venture capitalists show causal behavior before investment, one might expect them to show the same behavior while performing their technology commercialization activities.

Analysis however shows that most activities in general and typically all VC activities are executed effectually by Company. Explaining this counterintuitive result can be done by replacing the causal-effectual dimension with another one. Causal behavior can then be seen as controlling ventures; working towards a preset goal while protecting ventures' IP and product proposition and basing actions on comparisons between situation and prediction. Effectual behavior can be seen as supporting them; increasing ventures' available means through discussions, providing feedback and stimulate interaction with external parties so that additional goals become achievable (Read et al., 2009ab).

Although venture capitalists usually perform activities to exert influence on their ventures (Gompers & Lerner, 2001; Boeker & Wiltbank, 2005), results show that Company performs typical venture capitalist activities with a supporting perspective rather than a controlling one. This can be seen in the fact that Company limits itself to providing feedback on the actions of cluster managers and refrains from actual control until things tend to get out of hand completely. Company is therefore a source of support for the entrepreneurial cluster managers rather than a controlling organ. Since VC activities are performed with a supporting perspective by Company, the strong presence of effectual logic is understandable.

Whereas all VC activities are performed with a supporting or effectual perspective, this does not hold for every incubator activity. Merely the activities directed towards separate individual ventures, to which one can account VC activities as well, are executed with effectually and with a supporting perspective. Activities related to the organization as a whole – stimulating the environment of peers by planning interaction and arranging pooled administrative services – show causal logic and are performed with a controlling perspective. To identify a certain relation between activity type and decision-making logic, it therefore seems appropriate to use the distinction between differentiating activities for separate ventures and integrating activities for the organization as a whole rather than the one between incubator and venture capitalist activities.

Altogether, adding the support-control dimension to the causal-effectual one used in this study and using the differentiation-integration dimension to discern between performed activities helps to conclude this results section. Primarily, it explains why a distinction between incubator and venture capitalist activities is not effective; Company appears to be a specific type of incubator rather than a hybrid organization in its activities towards separate ventures since these are all performed with a

supporting rather than controlling approach. More importantly, a relation between the two newly developed dimensions can be identified in the form of Company using a support perspective and effectual logic in differentiation activities and a control perspective and causal logic in integration activities. This relation is depicted in the Company activity profile in Table 5.

	Support/Effectuation	Control/Causation
Differentiation	X	
Integration		X

Table 5: Company activity profile

5 Design

5.1 Design opportunities

The Company activity profile in the previous section shows that effectual decision-making logic is being used in differentiation activities while activities related to integration of multiple ventures into Company as a whole are approached causally. Similar to what Reymen et al. (2012) suggested for organizations in general, both decision-making logics are employed within Company simultaneously. There however exists a hidden problem with Company's decision-making logics.

Within the individual ventures, an overly effectual approach to decision-making provided by Company in their support activities can be balanced by a cluster manager adopting causal logic at times. The integrated Company network however, is merely influenced by its management which uses causal decision-making in this area. Since Sarasvathy (2001) argues that both logics should not be seen as contradictory but rather as complementary, it might be worthwhile to employ more effectual logic when executing integrative activities. More important however is that the causal approach towards the complete organization suggests that this aspect is merely being controlled where a supportive attitude might stimulate the internal Company network to bring forth more of its benefits for cluster managers.

That the design should focus on improving integrative activities performed by Company was corroborated by the design opportunities identified by cluster managers, irrespective to the decision-making logics employed. Firstly, it was seen that Company does not *provide office space and the associated building facilities*. Cluster managers must therefore arrange a place to work and all required equipment themselves. Naturally, this takes time which could otherwise be spent on venture development. Furthermore, an office would render physical interaction easier to achieve, which would in turn stimulate knowledge sharing (Hansen et al., 2000) and overall innovation (Phan et al., 2005). Additionally, it would provide a place where business contacts could be received and could get acquainted with the Company organization as a whole.

Secondly, the environment of peers currently consists of separate cluster managers interacting with each other and working together as partners rather than a team of colleagues. By *increasing the value of the internal network*, learning from one another and actually working together can be automated through team forming. This would help Company to reach up to their potential as an incubator organization with multiple incubates helping each other to develop their ventures and commercialize technologies (Hansen et al., 2000).

Thirdly, it was argued that Company should attempt to *improve the overall familiarity with the Company name and the associated brand*. Whereas results show that all individuals within Company have their large networks in the medical technology business and with subsidy providers, the link with the Company name has not been created yet. If this will be achieved, individual ventures can be recognized and identified earlier and – if the perception of Company is good – are more attractive as partner, subsidy project or investment opportunity. Especially the latter would be beneficial, since investments might then increasingly be made on Company level so that cluster managers can all benefit and have to spend less time searching for funding themselves.

Discussing the suggested design alternatives within Company led to the observation that providing office space is an important aspect in improving both the internal network through more frequent

physical interaction and the familiarity with the Company name through a stronger presence of overall organization. Therefore, it is not seen as a separate design opportunity. For the other two holds that both opportunities are perceived as valuable improvements for Company. Although improving the familiarity of the Company name was argued as most important aspect – young Company organization needs presence, especially in the minds of investors in order to acquire necessary funding to keep growing – it was said that the yet improving internal network should not be overlooked. The design provided in this section will therefore focus on improving both the familiarity with the Company name and the internal network among cluster managers.

5.2 Requirements

While creating a design that should improve name familiarity and the internal network within Company, certain requirements must be taken into account. Firstly, since Reymen et al. (2012), Sarasvathy (2001), and Read & Sarasvathy (2005) have yet suggested that both decision-making logics are often employed simultaneously and that one is not better than the other by definition, the created design should not focus on one of them. Even if the effectual approach is currently lacking in integrative activities, merely focusing on effectuation might tilt the balance to the other side. Moreover, although supporting rather than controlling separate ventures was considered effectual logic, creating a more supportive attitude in the internal organization as a whole might be possible through both effectual and causal approaches. For this reason, the main design should incorporate both decision-making logics.

Secondly, it must be taken into account that increasing name familiarity and the value of the environment of peers takes place through changing actions carried out by all individuals within Company. This renders every individual a user of the main design. More importantly, the ultimate beneficiaries of the networked incubator model are the cluster managers who might see their venture development facilitated. Company should therefore show that the actions identified in the main design in this research are carried out – either or not with the help of cluster managers – for the purpose of helping these cluster managers. This has the additional benefit that it helps Company's image with its cluster managers, of which the data has shown that is in need of an increase. Cluster Manager 3 for example quotes: *"Many aspects might be identified as Company's added value, though none are proven still"*. Since Company is not funding its ventures while it still captures most of a venture's future profit, its high share must be earned in other ways according to cluster managers. Executing actions with clear intended benefits for cluster managers might prove to be a first step herein.

Thirdly, Company's owners have a typical entrepreneurial point of view and do not want to invest significant amounts of their own capital. If Company is capable of acquiring capital without having to give up large shares of equity, either through a venture exit or from investors willing to invest in Company as a whole, this changes the situation. As this has however not yet taken place, certain actions incorporated in the main design might have to wait for future implementation, while others can be executed immediately. It might also steer Company to adopting an either causal or effectual approach in certain actions if one of these does not require (large) investments.

5.3 Design solution in literature

5.3.1 Networked incubator

In literature, an integrative approach towards improving both the value of the environment of peers within an incubator and the familiarity of its name is provided by both studies used to identify common incubator activities in the theoretical background of this thesis (Bollingtoft & Ulhoi, 2005; Hansen et al., 2000). Bollingtoft & Ulhoi (2005) have pictured the networked incubator as a specific form of a for-profit incubator that capitalizes on symbiotic potentials, maintains the development and nurture of their network, and stimulates inter-firm collaboration. It is based on social capital theory, which suggests that interpersonal relations in business are not merely economical but also have social dimensions (Burt, 1997; Nahapiet & Ghoshal, 1998; Adler & Kwon, 2002; Kenis & Knoke, 2002). Social capital then refers to the resources embedded in the social system consisting of the interpersonal relationships (Lin, 2001).

In order to use social capital to its full extent, incubators must attempt to institutionalize networking: putting mechanisms in place that enhance networking (Hansen et al., 2000) among incubates. More social interaction through these mechanisms makes it easier for individuals to trust and identify with one another, which makes them work together more efficiently. This would lead to faster recognition of synergies in resources, services, or skills and therefore symbiotic potentials (Bollingtoft & Ulhoi, 2005); for example when two or more incubates can form a joint partnership with an important product development party.

As can be seen in this example, not merely the internal network between incubates is important. Forming interpersonal relations with external parties is considered in the networked incubator model as well. Whereas partnerships between different incubates increase knowledge transfer and the exploitation of shared resources (Hansen et al., 2000), better interaction with external resource providers increases ventures' (social) capital (Totterman & Sten, 2005) from which the remainder of the networked incubator can then benefit as well. Therefore, a networked incubator institutionalizes networking both in its internal and external social environment (Bollingtoft & Ulhoi, 2005). If this succeeds, the combination of large scale and scope advantages due to the large and unified networked incubator and small, agile and innovative advantages of every individual venture in the network (Hansen et al., 2000) benefits the incubator and every incubate in it.

5.3.2 Company as a networked incubator

The networked incubator model would fit Company for a number of reasons. Firstly, results have shown that though venture capitalist activities are being performed, Company rather resembles an incubator organization than a VC. Not providing funding and actually being involved in helping ventures acquire investment capital are examples of this. Moreover, the support-control dimension identified in the results section shows that Company focuses on supporting their ventures through providing feedback instead of on controlling them, which is typical for an incubator organization. Secondly, two characteristics of a networked incubator – incubates (partly) being owner of the incubator organization and all incubates operating in relatively similar businesses and markets (Hansen et al., 2000; Bollingtoft & Ulhoi, 2005) – can already be perceived within Company. Thirdly, Company currently attempts to increase the value of the environment of peers through planning interaction between all cluster managers; a controlling perspective. However, Birley (2000) found that informal networks are way more often used than formal ones. Since informal networks cannot

be controlled by incubator management (Bollingtoft & Ulhoi, 2005) another – support oriented – approach to stimulate this internal network of peers might be warranted.

By incorporating the model of the networked incubator, Company primarily creates an environment of peers that is unified and in which each individual cluster manager is part of an integrated team rather than merely interacting around the problems arising in one of its own ventures. This directly addresses the first design opportunity mentioned in interviews: enhancing the value of the internal Company network. More detailed, weak ties between individuals stimulate idea generation, while strong ties enhance the level of problem solving (Leanard-Barton & Sinha, 1993; Henderson & Cockburn, 1994; Eisenhardt & Tabrizi, 1995; Hansen, 1999); both aspects are important for new venture development within Company. Practically, engaging in certain social networks can lead to both faster and better decision-making (Hansen et al., 2000).

Enhancing the internal social network might subsequently lead to joint activities towards the external environment by multiple ventures when symbiotic potentials arise through economies of scope and scale (Bollingtoft & Ulhoi, 2005). Already mentioned was the example of a joint partnership with a product development party; other alternatives might be shared subsidies, regional offices, or specialist services. Since Company is the entity binding the cluster managers engaging in joint activities, it will receive more attention when these networked activities on consortium level grow more frequent. This will ultimately lead to more name familiarity and a stronger Company brand: the second design opportunity mentioned in interviews. Consequently, individual ventures can then benefit from a reduction in investment risk through their association with a well-known incubator (Mian, 1996) – integrated in its external environment – and from funding arranged on Company level instead of by cluster managers themselves. In the impact model in Figure 2, it can be seen how becoming a networked incubator can, via actions partly taken up by cluster managers, eventually lead to benefits accruing to cluster managers.

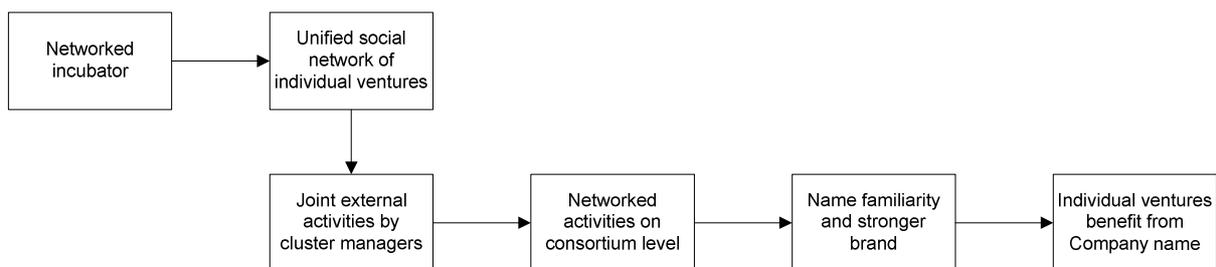


Figure 2: Impact model

5.4 Design parameters

For the purpose of becoming a networked incubator, this design suggests certain actions to be taken by Company. These actions are all related to certain design parameters in this study. The actions themselves are identified as parameter values and are twofold for every parameter: either causal or effectual. Since it was suggested that neither decision-making logic is better than the other (Sarasvathy, 2001; Read & Sarasvathy, 2005; Reymen et al., 2012), creating the actual design by choosing parameter values aligned with organizational structure and climate is left to Company in the implementation phase which is out of scope in this study.

All design parameters are derived from the two studies in which the networked incubator is introduced (Hansen et al., 2000; Bollingtoft & Ulhoi, 2005) and can be divided in four interrelated

categories. First, Company should arrange office space for the networking activities to flourish. Then, it should simultaneously instate networking mechanisms connected to interpersonal relations and to the construction of the incubator. Finally, it needs to establish links with the external environment. All design parameters and their causal and effectual values are portrayed in Table 6 and are elaborated on in the following paragraphs.

Design parameter	Causal value	Effectual value
Office space funding	Immediate investment with personal capital	Investment by funded venture in the future
Interaction possibilities	Periodically planned social activities	Increase occasional meetings between cluster managers
Synergies between incubates	Instate deal broker	Company level discussions focusing on multiple ventures
Bottom-up approach to incubator management	Co-ownership structure	Voluntary research on possible actions on incubator level
Variety in incubator members	Portfolio management	Additional selection criterion for business opportunities
Links with external environment	Analyzing possible partners for formal partnerships	Loose links with external experts towards officially binding proven partners

Table 6: Design parameters and their values

5.4.1 Office space funding

As a condition necessary for networking between incubates to flourish, Bollingtoft & Ulhoi (2005) suggest that physical proximity is of the utmost importance and cannot be replaced by mere mission statements and policies regarding to networking. As was already seen, it stimulates frequent interaction, knowledge sharing, and more innovative activities in venture development (Hansen et al., 2000; Phan et al., 2005). For this reason, Company should sooner or later arrange physical office space for cluster managers to work together as a team more easily.

Since Company is yet convinced of the advantages of a physical office, this first design parameter is not to arrange office space but how to fund it. Causally, an office can be arranged through investing capital immediately – either completely paid for by Company or partly by everyone’s personal capital. Afterwards, newly developed ventures can then rent separate spaces in this office, sized to their own willingness and possibility to invest according to the effectual investment principle. It can also be decided to take this up effectually from the beginning, by waiting for a venture being funded externally. This venture would then set up office in a strategic location, which could be used by other ventures in the same locality and for overall Company activities by everyone. It might also wear both the venture’s name and the Company name.

Discussions about how and when to invest in office space have yet been held many times within Company, with both the causal and effectual approach described above represented. The main argument for the causal approach is that Company must be a unified entity and therefore needs an office with its name. The effectual argument is based on using the office mainly for interaction between cluster managers operating in one another’s locality. This would logically mean that ventures should bear the costs of office space when it is being used. Since Company’s owners do not want to invest large funds of their own before having an exit, the effectual approach will probably be chosen. Although this diminishes the effects of the other design parameters to a small extent – by

not providing the necessary networking conditions – Company can also benefit from them being a virtual incubator (Bollingtoft & Ulhoi, 2005).

5.4.2 Instate networking mechanisms connected to interpersonal relations

5.4.2.1 Interaction possibilities

Networking mechanisms that should enhance interpersonal relations are initially related to Company providing the possibilities for cluster managers to interact. Furthermore, management should emphasize the importance of networking by showing that activities are carried out to stimulate it. As was seen in the results section, Company is already involved in causally stimulating business related interaction through planned contact moments; two monthly ones and attempted daily interaction. Birley (2000) however, found that informal networks are often more important than their formal counterparts so that Company should rather provide possibilities to interact socially. Examples are adding a social activity to the monthly meeting or organizing two annual activities, each time organized by other Company members to increase trust and identification even more.

Instead of causally using periodic social activities with the purpose of increasing interaction between cluster managers, Company can also approach this effectually. The frequency of occasional interaction between cluster managers can be increased by augmenting the issues for which cluster managers need others' input. For example, every venture can instate another cluster manager as 'board member'; not with the goal of finding flaws in venture management but to minimize the distance and facilitate communication between cluster managers. Since this idea was not only proposed by Hansen et al. (2000), but also by certain cluster managers in initial interviews, it might certainly be worthwhile to discuss.

5.4.2.2 Synergies between incubates

When management has provided the possibilities to interact (socially), it becomes easier to find synergies and symbiotic potentials between incubates. It was suggested by Bollingtoft & Ulhoi (2005) that collaboration between incubates, for which synergies are required, is a vastly larger advantage of incubators than mere learning effects. These synergies are manifested by the possibilities to buy from or sell to other incubates and to outsource jobs or sell overcapacity among others. They are caused by incubates having complementary skills, needs or resources and are therefore the prerequisites of economies of scope.

A causal approach for attending to this design parameter was provided by Hansen et al. (2000). It was argued to instate a specific deal broker that searches for synergies and attempts to create deals between incubates. The causal character lies in both the need to invest in such a function and in attaching goals – a number of potential deals per period for example – to his work. Within Company however, Owner 1 might engage in this since his task is yet to find external partners; why not focus on deals between incubates as well. Effectually, Company can add the search for possible synergies as a subject to meetings in order to not formally engage in it but certainly keep it in mind. Also, in these meetings it can attempt to generate discussions between cluster managers on higher level than the problems that arise within separate ventures; this might lead to cluster managers identifying aspects important for every cluster manager.

5.4.3 Instate networking mechanisms related to incubator construction

5.4.3.1 Bottom-up approach to incubator management

If incubates are together responsible for the incubator as a whole, social relations, trust and therefore networking activities are enhanced (Bollingtoft & Ulhoi, 2005). It was said that Company is already involved in this parameter causally, by giving cluster managers an equity stake not only in their own ventures but also in Company as a whole. This ensures that all cluster managers benefit from the success of others so that they tend to assist others when necessary.

In an effectual way, this bottom-up approach can be realized through letting incubates decide directly on actions taken on behalf of the incubator. An idea might be for cluster managers to voluntarily investigate possible actions that can be taken in order to improve overall incubator performance. Their findings can then be discussed every couple of months after which the next possible performance enhancer can be studied. Actually taking up some ideas flowing from this initiative might lead to cluster managers perceiving that they can influence Company as a whole and therefore stimulate their involvement in it.

5.4.3.2 Variety in incubator members

When individual incubates are involved in incubator related issues, it might become easier to create a portfolio of incubates that fits Company. While a networked incubator benefits from all incubates operating in similar markets (Hansen et al., 2000), variety in growth stages is beneficial. Whether this variety is being created causally or effectually, one aspect under consideration must always be that the incubator never grows too big; this can harm the formation of interpersonal relationship and therefore deteriorate the benefits of the networked incubator model (Bollingtoft & Ulhoi, 2005).

Difference in decision-making logics on this parameter is manifested in actively engaging in portfolio management causally or selecting whether new venture opportunities fit with Company when they arise effectually. Portfolio management mainly has the purpose of making the incubator consist of ventures in all different growth stages so that young ventures in the product concept phases can learn from ventures yet engaging in market introduction and vice versa. If this purpose is to be achieved causally, one can imagine that opportunity search might be put on hold at times when many new ventures have yet been created. If effectual behavior is chosen, opportunity search takes place continuously but the yet existing portfolio is incorporated as an important selection criterion for new business opportunities.

5.4.4 Links with external environment

After having created a strong network among incubates, Company as a whole should establish links with its external environment. In other words, Company gets networked with parties outside the incubator. Specifically this part of the networked incubator model is related to facilitating joint external activities by incubates because it will be easier to know where to go if certain external links have yet been established (Hansen et al., 2000).

These links can be created causally through analyzing possible partners on the complementarity of their knowledge to Company's own and subsequently forming a formal partnership. It might for example be useful to find investors as partners, since finding large second-round investors is where Company experiences high difficulty. Effectually, Company might eventually bind external experts to the overall organization after they have been working loosely with one or multiple individual

ventures in a satisfactory way. In either way, while binding external parties to the organization it must be taken into account that cluster managers remain in control of whether to use the knowledge of bound partners or not. If using the formal partners is forced upon cluster managers, this might hamper network activities since they do not have autonomy to benefit directly from their own networking (Hansen et al., 2000). Might Company in time possess office space, representatives of external partners might work there so that the distance between the incubator and its environment are being minimized and the networked model can flourish even more (Hansen et al., 2000).

Noteworthy in this aspect is that not only formal links can be beneficial. Company management might also occasionally but regularly talk to potential partners or investors among others; possibly in the form of external networking activities organized by Company itself. Since this is done without specific goals in mind and it rapidly integrates others in the Company business opportunities, this is another effectual approach to establish connections with Company external environment.

5.5 Main design

Although it was said earlier that creating the actual organizational design by assigning values to the different design parameters is left to Company, a practical and directly implementable design is provided here. This design integrates four of the parameters identified and leaves out the ones related to office space and variety in incubator members. The reasons for this are that office space was yet identified as a networking condition instead of an actual mechanism and that variety in incubator members cannot be easily and directly implemented since new business opportunities must first be available. Furthermore, effectual values were assigned to all four incorporated parameters since this logic still is the one lacking in the current approach towards the integrated Company organization.

The main design proposed in this study uses a different order than was considered while identifying the design parameters. Namely, the starting point is the 'links with external environment' parameter. It is suggested that Company, in overall consensus, should make cluster managers together responsible for taking the first steps in establishing *links with the external environment*. Discussions among cluster managers, without Company management presence in order to maintain the *bottom-up approach to incubator management*, should lead to areas in which every single cluster manager can contribute to the ultimate goal. One cluster manager might for example have interesting personal contacts with certain investors or administrative service providers among others, whereas another has strong relations with regional parties, and yet another might be able to arrange direct access to advertising options such as magazines or conferences. The means-oriented character of this approach towards the external environment clearly shows the effectual decision-making logic of this design.

Whilst cluster managers' engagement herein not only provides more frequent occasional *interaction possibilities*, knowing where others have their important contacts can also identify *synergies and scale and scope advantages between cluster managers*. These are not only beneficial for Company as a whole but evenly so for individual ventures. An additional advantage of this design and the networked incubator solution in general is that while creating a networked incubator in order to increase the *internal network's value* and the *overall name familiarity* of Company, exactly this is already set in motion when cluster managers work together in establishing links between Company as a whole and its external environment.

5.6 Testing

Although the testing, implementation, and evaluation phases that follow the design phase are out of scope in this study, possibilities in which the design can be tested are provided. Firstly, with the help of the practical and implementable design, a scenario in which all effectual values are assigned to the parameters can be discussed. In order to have a meaningful discussion however, a scenario in which causal values are chosen should be created as well. Based on both these scenarios, every parameter can be isolated from the rest and the most appropriate value can be assigned to it. By doing this for all parameters, an overall and ultimate organizational design is created by Company.

Hereafter, a thought experiment should be conducted where everyone involved within Company writes what they think will happen if Company executes all proposed actions according to the chosen parameter values. As this second discussion will probably lead to changes as well, the organizational design will be transformed to an organizational redesign and possibly (partly) incorporated. This second design might ultimately lead to a stronger Company network, better venture development by cluster managers and thus larger technology commercialization success for Company.

6 Discussion

6.1 Contributions

This research study attempted to answer the research question whether organizations involved in assisting start-ups with their technology commercialization use effectual decision-making logic in performing specific TC activities. These activities were identified as typical for incubator (Hansen et al., 2000; Bollingtoft & Ulhøi) or venture capitalist (Gompers & Lerner, 2001; Boeker & Wiltbank, 2005; Sahlman, 1990) organizations. Effectual logic was contrasted to its causal counterpart. Whereas causation argues that an uncertain future must be predicted so that clear goals can be set, effectuation suggests that the future is not uncertain but unpredictable which renders goal setting impossible; focus therefore lies on the means available in making decisions (Sarasvathy, 2001).

An initial contribution of this study is that it shows the presence of effectual decision-making logic in an organization assisting start-ups in technology commercialization. In fact, it was seen that effectuation is far more widespread than causation; it is both discerned in more underlying dimensions and plain simple in more technology commercialization activities performed by Company, the organization subject to this case study. Although sometimes different individuals use different approaches, Company in general tends to use an effectual approach in the majority of their performed activities. An interesting observation is that this holds for both typical incubator and typical venture capitalist organizations and that therefore no relation appears to exist between activity type and decision-making logic used. Since literature suggests that this result is counterintuitive based on the differences between VCs and incubators in their opportunity selection (Sahlman, 1990; Smilor & Gill, 1986), searching for an explanation seemed warranted.

Firstly, it is possible that indeed no such link exists. Employment of a certain decision-making logic can stem from something else. For example, the entrepreneurial attitude of Company's owners might ensure a more effectual behavior. Additionally, the fact that Company operates in the business of creating and developing ventures, for which it has been argued that effectual behavior might be beneficial (Sarasvathy, 2001), can also stimulate the overly use of effectual logic. A combination of both these factors is probably stronger related to the decision-making logics used than the activity, either typical for incubator or venture capitalist organizations, which is executed.

Secondly, an explanation of the counterintuitive result was already suggested in the results section. Whereas VCs typically have a control perspective towards their ventures through monitoring them and initiating management changes if necessary (Gompers & Lerner, 2001; Boeker & Wiltbank, 2005), incubators focus on supporting rather than controlling their ventures by providing facilities and business assistance among others (Hansen et al., 2000; Bollingtoft & Ulhøi, 2005). Company however, although possessing associated characteristics, is nothing like a venture capitalist. It lacks the main resource that VCs usually provide; it actually assists ventures in acquiring investment capital if possible from venture capitalists; and results show that although Company does monitor ventures and is theoretically capable of initiating changes in management, they rather provide feedback and assistance to autonomously operating cluster managers. Company therefore showcases a supporting perspective while performing both typical incubator and typical venture capitalist activities, seen in the provision of feedback and leaving responsibility to cluster managers to a large extent. For this reason, Company using effectual decision-making in the majority of their activities can be explained

since it aligns better with the supporting venture perspective present within Company than causal decision-making does.

Although it was suggested that activity type does not relate to decision-making logic when discerned between VC and incubator activities, discerning activities with the help of a differentiation-integration dimension might lead to interesting insights. Results have shown that all activities directly related to technology commercialization by ventures – differentiating between ventures when funding, coaching, and monitoring them among others – are performed by Company with a supporting perspective and the associated effectual decision-making logic. Activities that are related to Company as a whole – integrating ventures with the purpose of pooling administrative needs and services and making use of the internal network – are performed using causal logic and demonstrate a controlling perspective. This distinction can be explained by the observation that when ventures grow larger – as is the case when multiple separate ventures are treated as one large Company firm – they tend to use more causal logic than when they are still small (Brinckman et al., 2010; Sarasvathy, 2008; Read & Sarasvathy, 2005; Reymen et al., 2012).

Assuming the existence of a relation between the support-control and differentiation-integration dimensions and projecting it on incubator management, the second contribution of this study can be discerned. It appears that incubators might manage technology commercialization by incubates through supporting their ventures directly and effectually while controlling the organization as a whole causally.

The third contribution of this study lies in its proposed design that attempts to incorporate a support perspective in Company's management of the complete organization. Since it was already suggested that Company is a specific type of incubator, the design is based on the networked incubator model; a model focusing on both the internal and the external network of incubator organizations which were argued to harbor the most valuable services for incubates (Bollingtoft & Ulhoi, 2005). Specifically interesting is that this study has developed both causal and effectual approaches to the yet identified aspects that an incubator should focus on when achieving the networked status (Hansen et al., 2000). Both complementary decision-making logics (Sarasvathy, 2001) might namely be used simultaneously in creating a supportive perspective to incubator management.

6.2 Managerial implications

With the purpose of reaping more benefits from the internal network of cluster managers and the familiarity of the Company name, and hopefully increasing Company's future technology commercialization success, this study attempted to create a supportive perspective in managing the organization as a whole. Specifically, causal and effectual ways of becoming a networked incubator were provided to Company in the form of an organizational design.

Since Company has merely been involved in controlling the integrated network through planning interaction moments, incorporating a supportive attitude cannot be done without additional effort on the account of Company management. Both owners might have to spend time on creating an environment in which networking can flourish while they usually spend it on finding new opportunities and on managing other businesses that they own besides Company. In other words, management might have to concentrate on developing existing ventures rather than on continuously searching for new business opportunities. Although this suggests causal logic in focusing on ventures which yet have formalized development goals, the way in which this focus is manifested in the design

rather shows effectual decision-making. Since the design primarily attempts to increase the value of the internal Company network, it is related to using social resources present within Company more effectively and efficiently. This can be seen as an increase in available means and subsequently in achievable goals in light of technology commercialization (Sarasvathy, 2001; Read et al., 2009ab).

Besides changing the activities that time is being spent on, integrating cluster managers more and more in overall Company issues and management can also require owners to moderately alter their perception towards how to coordinate Company. At times, the attitude of being an entrepreneur, who is responsible for Company and by association for every venture, should possibly shift towards being a facilitator that creates an environment in which cluster managers can operate effectively and efficiently.

On operational level, Company might benefit from the fact that effectual logic and a supportive perspective are already present in how separate ventures are being coordinated and facilitated. Initiatives to opt for a similar approach towards the integrated Company organization are aligned with overall company ideas and might therefore receive positive support from cluster managers more easily. Naturally, Company's overall effectual stance must then first be communicated internally and explained to cluster managers. Since effectuation is suggested to help new and developing ventures prosper (Sarasvathy, 2008) and a supportive perspective towards separate ventures is yet valued by cluster managers, this can probably be done without great difficulties. An additional advantage is that explaining on what grounds decisions are being made in general might create consensus more rapidly among everyone involved in Company; not merely associated with the proposed design but in current daily activities as well.

Whereas operating effectually might be beneficial in the process of maintaining an entrepreneurial climate within Company, it must be guarded that ventures themselves do not stick to using effectual logic. When goals start to form and future products can be discerned increasingly, causal logic with a strong goal focus is suggested to be required for efficiency in later product development phases (Sarasvathy, 2008).

6.3 Limitations and future research

It was already said that the retrospective character of the data used might lead to biased results through cognitive limitations, lack of crucial information, framing of research questions, and the tendency towards giving socially desirable answers (Huber & Power, 1985; Miller et al., 1997; Schwenk, 1985) among others. Although certain measures have been taken to overcome these issues, possibly present bias would have been minimized by making use of real-time data.

Two other limitations present in this study are related to the data collection and analysis. Firstly, the number of people that were interviewed is limited to the two owners of Company and three of the current four cluster managers. Interviews with more individuals might have led to more, stronger or different insights. Secondly, coding for both commercialization activities and decision-making logics used has been done merely by the researcher. Moreover, the result of this coding process has not been corroborated by other researchers afterwards. Being able to make use of only one interpretation might have led to biased analyses and therefore conclusions. These possibly biased conclusions have however cleared the way for avenues of future research.

Firstly, the conclusion that Company approaches separate ventures effectually but uses causal logic in aspects related to the organization as a whole might be worthwhile to validate for other incubators or venture capitalists. Moreover, investigating whether this distinction is warranted for organizational performance engaged in technology commercialization can be interesting as well. These future studies would be aligned with studies actually engaged in investigating interplay between both decision-making logics; Kraaijenbrink & Ratinho (2012) and Fisher (2012) have yet suggested that instead of creating a continuum, causal and effectual logic are orthogonal. Employing both logics in different organizational aspects might therefore be the way to go; possibly even by employing causal logic strongly on one underlying dimension (Read et al., 2009) and effectual logic on another.

Secondly, within the hybrid organization of Company it is specifically interesting is to investigate how the ratio of incubator and venture capitalist commercialization activities does or should change in light of an approaching exit. Due to venture exits being areas of expertise of venture capitalists rather than incubators, it might be expected that Company will become more engaged in this type of activities. Moreover, at the time of an exit the importance of deal making and basing this on financial projections increases so that causation might start to play a more important role in the organization's activities. Since Company still has not benefited from an exit but the first one can increasingly be discerned on the horizon, this might actually be a future research project that can be executed by a next graduate student.

Another limitation to this study can yet be identified in the theoretical section. Although all activities that are labeled to be typical for incubator or venture capitalist organizations have been identified in literature, other studies might have come to other qualifications than the studies that were used in this research. If this would indeed be the case, Company's characterization might be different since these activities have served as the basis for the analysis in this study. Additionally, the decision-making logics used were analyzed in light of these activities so that this part of the analysis might be biased as well. In order to overcome this, future studies should not focus on separate activities carried out by these organizations, but more on their general way of operating towards technology commercialization. This way, the researchers are not bounded to an activity template and can stumble onto additional results.

Finally, a limitation can be identified in the fact that while Company is engaged in assisting new ventures in their technology commercialization, it is not a typical incubator or venture capitalist. More generally, conducting a case study within one organization – even when multiple ventures in different growth stages have served as units of analysis – decreases generalizability to other organizations. This is manifested not only in Company being a unique organization in terms of structure and ownership, but also in their strong involvement in the specific market of medical technology. In order to increase generalizability and to actually investigate whether incubators or venture capitalists use effectual decision-making, future research should be conducted in multiple organizations yet identified as typical incubators or venture capitalists, operating in different markets and countries.

7 Conclusion

This study has shown that an organization engaging in technology commercialization does employ effectual decision-making. Moreover, effectuation even plays a more important role than its causal counterpart. While causal logic is merely manifested in the basis for action dimension in which goals and projections are important before making decisions, every underlying dimension is represented in the effectually performed activities. Actions are often being taken in the moment without a preset goal, knowledge about a changing environment and interaction with partners are being used in product development, and investment in fixed assets takes place in small steps. The fact that effectual logic is so much more widespread than its counterpart, might suggest that a few causally performed activities are exceptions in a further effectually operating organization in light of technology commercialization.

Additionally, this research concludes that mainly effectuation logic is being used irrespective to the type of activity performed. This suggests that no explicit link exists between TC organization type and decision-making logics and that both incubators and venture capitalists are, to a certain extent, capable of adopting effectual decision-making approaches. A different and unforeseen relation between activity type and decision-making logic was however explored. Whereas activities directly related to technology commercialization by separate ventures are executed effectually, issues related to the organization as a whole are approached more causally. Relating effectuation to supporting ventures and causation to controlling the achievement of their preset goals, incubators appear to manage technology commercialization by providing separate ventures with support effectually while causally controlling the integrated incubator organization.

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Appendices

Appendix 1: Interview questions for Company management

General

In your view, what are important factors why new ventures fail? Why specifically these?

What actions are undertaken to overcome these?

What is Company's organizational structure? How were recent changes herein welcomed? If any, what additional changes are necessary?

Facilitation activities

Can you describe the support activities that Company performs for their ventures? And what is the role of the supporting companies herein?

What concrete network advantages does Company provide their ventures with?

What are the roles and responsibilities of Company and the individual cluster managers respectively?

What is Company's added value?

Interaction

What types of interaction does Company have with their ventures? When? Why?

What crucial events have taken place within the four selected ventures or business cases and what role did Company play in these?

How does Company coordinate their ventures?

How does Company coach their cluster managers?

How does Company stimulate learning, for example through interaction between different cluster managers or best practice sharing in some other way?

What is Company's role in the formation and execution of a venture's vision and strategy?

How is Company engaged in creating team spirit among cluster managers?

Appendix 2: Interview questions for cluster managers

General

In your view, what are important factors why new ventures fail? Why?

What actions are undertaken by Company to overcome these?

What is Company's organizational structure? How were recent changes herein welcomed? If any, what additional changes are necessary?

Facilitation activities

Can you describe the support activities that Company performs for you? And what is the role of the supporting companies herein?

What concrete network advantages does Company provide their ventures with?

What are the roles and responsibilities of Company and the individual cluster managers respectively?

What is Company's added value?

Interaction

How do you interact with Company? When? Why?

What crucial events have taken place in your venture or business case development and what role did Company play in these?

How does Company coordinate their ventures?

How does Company coach their cluster managers?

How does Company stimulate learning, for example through interaction between different cluster managers or best practice sharing in some other way?

What is Company's role in the formation and execution of a venture's vision and strategy?

How is Company engaged in creating team spirit among cluster managers?

Appendix 3: Codification table

Code	Implication
DCA	Descriptive comment on causal logic on the basis for action dimension
DCE	Descriptive comment on causal logic on the reaction to environment dimension
DCO	Descriptive comment on causal logic on the interaction with others dimension
DCI	Descriptive comment on causal logic on the investment principle dimension
DEA	Descriptive comment on effectual logic on the basis for action dimension
DEE	Descriptive comment on effectual logic on the reaction to environment dimension
DEO	Descriptive comment on effectual logic on the interaction with others dimension
DEI	Descriptive comment on effectual logic on the investment principle dimension
NCA	Normative comment on causal logic on the basis for action dimension
NCE	Normative comment on causal logic on the reaction to environment dimension
NCO	Normative comment on causal logic on the interaction with others dimension
NCI	Normative comment on causal logic on the investment principle dimension
NEA	Normative comment on effectual logic on the basis for action dimension
NEE	Normative comment on effectual logic on the reaction to environment dimension
NEO	Normative comment on effectual logic on the interaction with others dimension
NEI	Normative comment on effectual logic on the investment principle dimension