

# Consultancy as business activity to stimulate development of University Spin Offs

An explorative study into multiple business activities employed by University Spin Offs

August, 2009



This thesis is submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

MANAGEMENT OF TECHNOLOGY

Delft University of Technology, faculty of Technology Policy & Management

MSc. Management of Technology

Section of Technology, Strategy & Entrepreneurship

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## Acknowledgements

This report is a result of the thesis for the MSc program Management of Technology at the section of Technology, Strategy and Entrepreneurship within Delft University of Technology.

Although I have put a lot of effort into this study, without the help of some others this study would not have been possible. Therefore, I need to thank those who have contributed to the results and the process of this research.

First of all, due to the cooperation of the entrepreneurs who have been interviewed this study can contribute to a fairly new field of research. Thanks to Actiflow, DelftDynamics, Intespring and Quintech. Secondly, thanks to YES!Delft for assistance in establishing contacts with the entrepreneurs and giving their perspective on consultancy in University Spin Offs.

Furthermore, I need to thank my board of supervisors, who have provided me with frequent feedback and discussions on the progress of the thesis study. Due to the board of supervisors I have been able stick to my schedule.

Finally, I would like to thank those who have read, corrected and criticized my report and have involved in discussions about my findings.

## Executive summary

This paper investigates the role of consultancy as business activity within University Spin Offs (USOs) that have an initial focus on New Product Development (NPD). Although the strategy of full focus on NPD is generally supported, many USOs employ consultancy activities besides NPD. This phenomenon in USOs has not received much attention in literature. Therefore, this explorative research adopts a case study strategy with the objective to induce theory from case study evidence. The following set of research questions and sub-questions are defined to study the role of consultancy as business activity within USOs:

***What is the role of consultancy in the growth process of new product development oriented university spin offs?***

- 1) What are the drivers for a new product development oriented USO to employ consultancy as business activity?*
- 2) When do new product development oriented USOs employ consultancy activities?*
- 3) What are the consequences of employing consultancy for the university spin off?*

To improve the knowledge on the coexistence of consultancy activities and NPD activities within a USO, 4 spin offs from Delft University of Technology are studied. The study is divided into three phases: Theory development; Data collection; and Data analysis. Mainly qualitative data is collected from interviews with key persons involved in the development process of the USOs.

The results indicate that most USOs that employed consultancy activities were driven by an unexpected need to increase cash flow and they did not consider offering consultancy services as business activity in advance. Improving the resource position of the company in the short term was the main driver. However, the consequences of this strategy go beyond improving the resource position. All cases indicated that the consultancy activities have contributed to the recognition of new opportunities, improved the position in the business ecosystem and indicated that consultancy projects may evolve into NPD projects. Risks attached to this strategy are delaying NPD efforts; emerging intellectual property (IP) conflicts due to unclear agreements on contractual development as consultancy partner or joint development as NPD partner; and a permanent shift of balance towards consultancy as core activity and NPD as side activity. Shifting the balance may result in the USO adopting a low risk strategy with low growth perspectives.

These results indicate that employing consultancy as business activity has high impact on the development process of the USO. Therefore, it is recommended to further improve the knowledge on the consequences of employing consultancy activities in university spin offs with an initial focus on new product development.

The paper relates the results of the study to literature on ambidexterity and to literature on development phases of USOs.

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## 1. Problem orientation

### 1.1 Introduction

The commercialization of knowledge created within the university through spin offs (USOs hereafter) has become increasingly popular (Wright et al., 2004; Mustar et al., 2006). USOs are companies started by university affiliates with the objective to commercialize knowledge created in the university (Pirnay et al., 2003).<sup>1</sup> However, despite the increasing popularity of USOs, the understanding of the startup processes and strategies among scholars and practitioners has remained limited. There is only a limited number of studies on strategies that lead to successful development of USOs (Clarysse et al., 2005). An example of a strategic aspect of which little is known is the balance between different business activities USOs can employ (e.g. Mustar et al., 2006):

On the one hand, a USO can adopt a technology push strategy (Nagel, 2003). With this strategy the core activity of the USO is new product development (NPD hereafter) based on knowledge created within the university.<sup>2</sup> A technology push strategy has a strong internal focus on business activities that directly stimulate the progress of NPD. This strategy is perceived as the most effective means to commercialize knowledge created in the university since a focus on NPD leads to fast market introduction of a product with scalability advantages (Feezer & Willard, 1990).

On the other hand, a USO can adopt a market pull strategy (Nagel, 2003). With this strategy the USO employs external focused business activities and therefore interacts more with the market as compared to an internal focus. An example of an external focused business activity is offering consultancy services; since no internal development of a product is required, the USO needs to interact with the market in an early stage to promote its consultancy services.<sup>3</sup> The external focus can result in improving the knowledge from the market the USO is operating in, generate early revenues before a product is finished or generate new ideas for future NPD projects (Sanz-Velasco & Seamundsson, 2008).

Currently the technology push strategy is the most widely supported for successful development of USOs.<sup>4</sup> However, it is observed that USOs do not adopt a single internal focus on NPD as their core activity but employ multiple business activities, both internal and external focused. In a single USO NPD (internal focused) and consultancy (external focused) activities can be employed in parallel (e.g.: Feezer & Willard, 1990; Ndonzuau et al., 2002). However, little is known in literature on USOs about the balance between NPD as core activity and consultancy as a side activity.

Although the phenomenon of employing other business activities besides the core activity has not been studied on the level of USOs, it has received attention in literature on corporate strategies. Literature on ambidexterity describes how corporations employ multiple business activities in order to stimulate long term development (Birkinshaw & Gibson, 2004). By not just employing internal focused activities but employing external focused business activities as well, the company increases its adaptability and is more likely to stimulate development through improvement of the knowledge base and recognizing new opportunities. A vast range of studies into managing the balance between multiple activities has been conducted on the level of corporate strategy (e.g. Lubatkin et al., 2006).

<sup>1</sup> For a definition of university spin off refer to: Appendix I: Case study protocol

<sup>2</sup> For a definition of new product development refer to: Appendix I: Case study protocol

<sup>3</sup> For a definition of consultancy refer to: Appendix I: Case study protocol

<sup>4</sup> Following from discussions with Job Nijs, director of incubator YES!Delft, 1/4/2009 & 6/4/2009

However, for USOs it is not known how multiple activities complement each other, what frictions are present, how the balance between internal and external focused business activities is managed and what the influence of these activities is on the development process of a USO (Birkinshaw & Gibson, 2004; Lubatkin et al., 2006; Mustar et al., 2006; Raisch & Birkinshaw, 2008).

This study opens the field of research into multiple activities employed within a USO by studying the role of consultancy as business activity in USOs with a focus on NPD. Therefore, the research topic of this study is the role of multiple business activities in the development process of university spin offs.

This explorative research adopts a case study strategy using 4 cases that started with NPD as core activity and shifted their focus to consultancy activities. Insight is provided in the drivers and consequences of engaging in multiple business activities and relates these activities to the growth process of a USO.

The report is structured as follows: First the research questions are presented. Second, the literature on USOs and methodological considerations are discussed. Furthermore, theory development and case study evidence is presented. Finally, the conclusions are followed by a discussion on the potential value of consultancy and suggestions for further research are given.

## 1.2 Research question

The research topic is translated into the main research question:

***What is the role of consultancy in the growth process of new product development oriented university spin offs?***

The main research question is divided into three sub-questions. The first step in understanding the role of consultancy in USOs is to know what motivates USOs to shift their focus from product development activities to consultancy. Therefore, the first sub-question studies the drivers of USOs to engage in consultancy:

*1) What are the drivers for a new product development oriented USO to employ consultancy as business activity?*

As the role of consultancy is related to the development process of the USO the second sub-question explores in which development phases USOs decide to change their focus and start offering consultancy services to their customers. Therefore, the second sub-question relates the drivers to engage in consultancy with the growth process:

*2) When do new product development oriented USOs employ consultancy activities?*

Finally, the consequences of engaging in consultancy might be in line with the drivers. However, there may be (positive or negative) consequences that were not anticipated beforehand. Therefore, the third sub-question studies the consequences of consultancy activities for a USO:

*3) What are the consequences of employing consultancy for the university spin off?*

## 1.3 Research objective

The objective of this research is to improve the knowledge on the role of NPD and consultancy activities within a USO. First, the research aims to improve the understanding of the drivers for an entrepreneur to engage in consultancy while the initial plan was to develop a product. Second, the

research aims to provide insight in which development phase of the development process consultancy is most likely to be employed and finally insight is provided into the consequences of engaging in consultancy.

Furthermore, this study attempts to add to several fields of scientific research and provides some managerial implications.

### **1.3.1 Scientific relevance**

Not many scholars have studied the internal processes of USOs. Although it has been identified as a relevant research topic not much is known yet from the balance between different business activities such as NPD and consultancy (Mustar et al., 2006). The body of knowledge on internal processes of USOs is increased by showing that a USO does not adopt either an internal or external focused strategy, but rather strikes a balance between them. It is shown how the balance between internal and external focused business activities is created and what the effect is of employing multiple business activities on the development process of a USO.

This balance between internal and external focused business activities has been the subject of study in research on corporate strategy using the term ambidexterity (Berkinshaw & Gibson, 2004). In large corporations these activities are separated in different departments. However, less is known on how small firms deal with managing different business activities. This study contributes to literature on ambidexterity by showing the presence of ambidexterity in USOs and indicating how ambidexterity is managed within USOs. Furthermore, some insights are given in the consequences of ambidexterity in USOs.

Studies on the development process of USOs are not extensive yet (Djokovic & Souitaris, 2008). Several scholars have studied factors that can impede the development process of the USO (Djokovic & Souitaris, 2006). From these studies models have been created that explain the development process as a sequence of phases with obstacles that may impede development. However, up to date no research is known that explains possible ways to resolve these obstacles. This study adds to the understanding of the development process by indicating how obstacles that impede further development can be resolved through employing multiple business activities.

### **1.3.2 Managerial implications**

Currently university incubators and technology transfer offices stimulate USOs to focus on their core activity, to pursue successful NPD, and consultancy is perceived as a distraction from the core activity that impedes NPD. This indicates that USOs are currently not stimulated to consider employing consultancy when planning their business. Although USOs are stimulated to adopt an internal focus on NPD, it is observed that many USOs increase their external focus by employing consultancy activities. This indicates that employing multiple business activities is a relevant scenario to consider in business planning.

Therefore, this study shows how an internal (NPD) and external focus (consultancy) can be balanced in a USO with an initial focus on NPD and what the results are of this balance. Entrepreneurs that understand the balance between multiple business activities can better plan their business based on scenarios and can better respond to events that require the management team to employ alternative business activities.

Furthermore, as the opinions on incubators, universities and investors are based on perceptions rather than general theory this study can improve the understanding of the benefits and risks of different business activities. The result is that these organizations can better adapt their support to

the need of the USO. Therefore, the findings of this study may assist practitioners in resolving the dilemma organizations in general face of adopting an internal or external focus.

## 2. Literature review

Although research in the field of new ventures and entrepreneurship is relatively new, the emergence of new ventures accounts for a range of positive economic developments and technological developments in society (Autio, 1994; Bekkers et al., 2006; Grilliches, 1991). Hence, the importance is widely recognized by researchers. The acknowledgement of the positive societal effects of new ventures is indicated by the emergence of business incubators. In North America the number of business incubators increased from 12 in 1980 to over 1.400 in 2006. In 2001 these incubators assisted over 35.000 new ventures jointly providing employment for 87.000 individuals (NBIA, 2009; Tamasy, 2007).

The facts mentioned above indicate the relevance of understanding business processes within new ventures. As this study focuses on business processes within a specific type of new ventures, university spin offs, the following section explains how the study fits into the literature on new ventures.

The objective of this section is to show how this study will add to the literature on new ventures by identifying a research gap that will be partially resolved by this research.

The literature review provides a brief overview of the research field by a review of literature on new ventures and the studied concepts within this research field, followed by a review of studies performed on the level of USOs. Finally the research gap within the literature field of USOs is identified (Figure 1).

### 2.1 New Ventures

Organizational research on new ventures broadly distinguishes the following three categories:

Independent start ups are created by entrepreneurs with a business idea that start their own company and are not affiliated to a parent organization such as a public research laboratory or a larger corporation (Ensley & Hmieleski, 2005).

Corporate spin offs are created when the business idea is based on knowledge and competencies developed in the parent firm (Parhankangas & Arenius, 2003).

University spin offs are new firms created to exploit knowledge, technology or research results developed within a university (Pirnay et al., 2003).

Many scholars have conducted descriptive (Bruno et al., 1992), explorative (Delmar & Shane, 2004) and empirical research (Ebben & Johnson, 2006) with the objective to understand the growth patterns of new ventures in general and to indicate the differences among the three sub fields (Dahlstrand, 1997; Zahra et al., 2007). The black arrows in Figure 1 represent these studies.

Furthermore, concepts have been developed that explain processes of the start up phase like the liability of newness (Stinchcombe, 1965; Henderson, 1999), skills brokerage (Papagiannidis & Li, 2005) and bootstrapping (Ebben & Johnson, 2006):

- The liability of newness is one of the first concepts on the internal processes of new ventures. It suggests that failure rates of new ventures decreases with the age of the firm, since young firms must divert scarce resources to develop a support structure and establish credible exchange relations. Older firms have developed these support structures and need to allocate only a small share of resources to support them.

- Skills brokerage is a model that is more recently developed. This conceptual model suggests that new ventures can overcome skills constraints by opening up their network of relations to acquire the skills to sustain their business and increase chances of survival.
- Bootstrapping is another recently developed concept for new ventures to overcome constraints typically faced by new ventures. Small firms respond to financial constraints by bootstrapping; finding alternative financing means to avoid the need for external financing.

Several scholars have developed strategic models based on the previously mentioned concepts to deal with constraints and improve performance (E.g.: Venkataraman & Van de Ven, 1998; Vohora et al., 2004). Venkataraman & Van de Ven (1998) relate the set of relations of a new venture to the liability of newness and adolescence. They propose a strategy for new ventures to maintain relations or add relations in different phases depending on their newness. This strategy would aid in resolving constraints and improving performance.

The overarching dotted line in Figure 1 represents the above mentioned concepts and strategic models that are developed for new ventures.

Besides the studies conducted on the level of new ventures, scholars have further narrowed down the research field to the sub field of university spin offs.

## 2.2 University Spin Offs

Since the first studies that have narrowed down the research field into the sub field of university spin offs, the relations between a wide range of variables for different types of university spin offs are analyzed.

The dependent variables that are most frequently researched are growth patterns (sales growth and employee growth), performance (sales and turnover per employee) and survival rates (Delmar & Shane, 2004; Aspelund et al., 2005). The literature review indicates a number of frequently used independent variables such as: geographic location (Walsh et al., 1995), supportive structures (incubator, technology transfer offices) (Clarysse et al., 2005), financing means (Clarysse et al., 2007; Wright et al., 2006), university resources and capabilities (Wright et al., 2004) and sector (Walsh et al., 1995).

The studies on differentiation of geographic location and sector show results that are descriptive and explain differences in performance. The results of studies into supportive structures and financing ways give insight into internal processes and strategies of USOs. These studies can help entrepreneurs in developing a strategy on how to be supported and how to finance the start-up process. The descriptive studies precede the studies on internal processes and strategies and therefore take a larger share in the research field of USOs (Djokovic & Souitaris, 2006).

Although a vast range of studies on USOs is conducted, a consistent definition of the university spin off has lacked for a long period. Some researchers identify a USO as “... a new company that is (1) formed by individuals who were former employees of a parent organization, and (2) a core technology that is transferred from the parent organization” (Steffensen et al., 2000) while others define USOs as “... new companies set up by a host institute (university, technical school, public/private R&D department) to transfer and commercialize inventions resulting from the R&D efforts of the departments” (Clarysse et al., 2007).

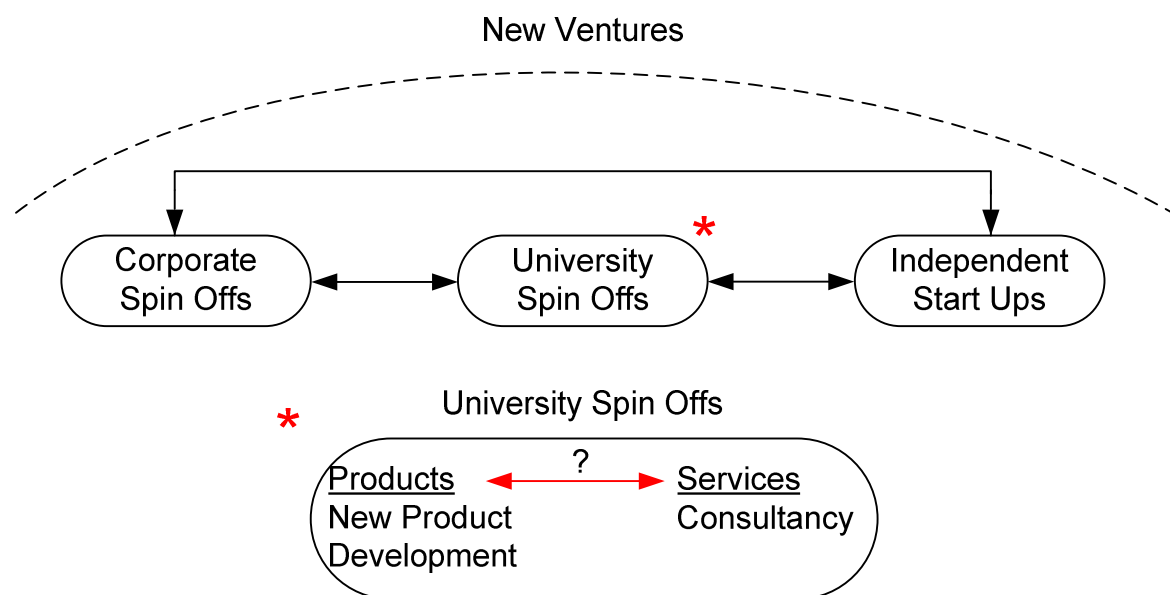
Besides the fact that the previously used definitions are not consistent, they are not exhaustive either. By “*transferring a core technology*” or “*commercializing inventions*” it is implicitly assumed that the USO’s core activity is product development based on a concrete technology or invention. This lack of consistency and exhaustiveness in the definitions used in previous studies is identified by Pirnay (2003). The definition of Pirnay (2003) should cover all firms that spin off from a university: “*University spin offs are new firms created to exploit knowledge, technology or research results developed within a university.*”

With his definition Pirnay (2003) indicates that not only product oriented firms are regarded as USOs, but a USO can be service oriented as well as long as it is exploiting knowledge, technology or research results that are developed within the university.

The need to regard USOs as firms that can both employ product development activities and service activities is recognized by Mustar et al. (2006) who indicate that there is a lack of research that focuses on the role of different business activities within a USO. They conclude that there is a need to study the coexistence of different business activities within USOs in order to better understand the role of different business activities in internal processes of USOs. The red arrow in Figure 1 represents the lack of research that focuses on the role of different business activities within a USO.

Figure 1 shows the breakdown of the research field and the following research gap:

**No studies have been conducted on the level of business activities within USOs and knowledge lacks on the role of different business activities within USOs.**



? = Research Gap

### Figure 1: Research on new ventures

The following further elaborates on the position of this research topic within the research gap identified above.

Although knowledge on the role of employing both products and service activities is lacking, it appears from practice that many USOs do not focus either on product development or service activities. Rather they employ a mix between product development activities and service activities. For example, product development (generally regarded as internal focused core activity) is

complemented by offering consultancy services (generally regarded as external focused side activity).<sup>5</sup>

The only study known at this time that identifies coexistence of internal and external focused business activities as strategy is from Ndonzuau et al. (2002) who state that a new product development oriented USO can temporarily shift its focus to consultancy activities in order to reduce risks and stimulate development. Although it has been stated that a temporary shift of focus to consultancy can stimulate the development of a USO there is no research known up to date that explores how USOs deal with shifting their focus from the core activity to consultancy activities. Therefore, this research attempts to fill part of the research gap by improving knowledge on the role of consultancy activities on the development process of USOs with an initial focus on NPD as core activity.

Following from the literature review, the role of external focused consultancy activities in USOs with an internal focus on NPD has not been studied before. Therefore, no theoretical propositions that can be empirically tested are available as starting point for new research. This in turn implies that the next step to fill part of the existing research gap is to conduct an inductive study to explore the role of consultancy in USOs (Yin, 2008).

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<sup>5</sup> Following from discussions with Job Nijs, director of incubator YES!Delft, 1/4/2009 & 6/4/2009



### 3. Methodology

In the Literature review it is suggested to conduct an inductive study due to the absence of theoretical propositions that can be empirically tested. Exploring the possible relations between variables forms the basis for theory development (Eisenhardt, 1989; Van der Velde et al., 2004).

Therefore, this study adopts a case study strategy using mainly qualitative data to explore the role of consultancy in USOs and generate theory that can be tested in future empirical studies (Eisenhardt, 1989).

The following presents the methodological considerations for this case study research. First, the research design is presented. Furthermore, the considerations concerning quality and limitations of the study are discussed.

#### 3.1 Research design

The research method relies on a three-phase approach. First, existing theories that are developed and tested in other research fields are studied to create a theoretical framework of expected relations. To obtain a rich understanding of how consultancy is dealt with in USOs an inductive approach is adopted and no theoretical basis will be used in the data collection phase (Wright et al., 2004). Second, a number of University Spin Offs is selected and analyzed. The third step combines the theoretical suggestions with the case study evidence and analyzes differences and commonalities from which the theory is generated.

##### 3.1.1 Phase 1 Theory development

The theoretical study aims to propose the expected role of consultancy in USOs by referring to studies in other fields of research and applying the existing theories on USOs. Two fields of research that are included are research on corporate transformation and strategy, on drivers for change and on development processes of USOs. The findings are used to identify the expected drivers for a USO to employ consultancy as business activity and how consultancy fits within the development process of a USO. The sub-questions “What are the drivers for a new product development oriented USO to employ consultancy?” and “When do new product development oriented USOs employ consultancy activities?” are explored in the first phase.

The theory development serves the purpose to provide some insight into possible relations before the case study data is collected. It does not serve to develop propositions that will be tested through the case study. Therefore, the results of the study into the possible drivers of consultancy will not be used as input for the data collection, but will be related to the case study evidence in the final conclusion.

##### 3.1.2 Phase 2 Data collection

The emphasis of the study is on the case study data collection. The objective of this phase is to create insight into how the drivers to employ consultancy are linked to the development process, and how the consequences of employing consultancy are positioned within the development process.

Prior to data collection the cases are selected and the data collection methods are specified in this section.

To develop a theory from case study evidence a multiple case study approach is adopted. Therefore, 4 cases are selected that enable replication of findings (Eisenhardt, 1989; Yin, 2008). The following selection criteria are used to select 4 cases:

- 1) The selected cases are USOs according to the definition of Pirnay et al. (2003);
- 2) The USO is established by the entrepreneurs with the intention to develop a product;
- 3) During the development of the USO the business activities included offering consultancy services;
- 4) The University Spin Off should be in the 4<sup>th</sup> or 5<sup>th</sup> phase of development according to the growth model for University Spin Offs by Vohora et al. (2004);
- 5) The University Spin Off is not necessarily in an incubator of the university or any other organization;
- 6) At least one of the cases is or has been funded by external capital;
- 7) From four cases at least two different sectors should be represented.

Using these selection criteria the following cases are selected (Table 1):

**Table 1: Selected cases**

	Name	Sector	Founding year	External Financing	#FTE
1	Actiflow	Aerospace	2005	Y	7
2	DelftDynamics	Aerospace	2006	N	4
3	InteSpring	Home appliances	2005	N	5
4	Quintech	Logistics	2006	N	9

The selection of cases and the characteristics is discussed in detail in Appendix I.

Data from each case is collected through interviews. For each case at least two key persons are interviewed using a semi-structured interview approach. To avoid bias one of the entrepreneurs/founders, a representative from the incubator and an investor (if any) are interviewed. The interviews with the entrepreneurs and incubator representatives are face-to-face interviews.

Furthermore, if available, archived data is used to collect financial data that may serve as an objective measure for the influence of different business activities on the development of the USO. This strengthens the qualitative findings from interview data (Yin, 2008).

All data collection considerations are described in detail in the case study protocol (Appendix I). The case study protocol guides the investigator in carrying out the data collection and ensures that equal methods are used for each case (Yin, 2008). The case study protocol defines the units of analysis, contains case selection criteria and describes data collection procedures and required preparation for data collection. Furthermore, it contains interview protocols and an outline of the case study report.

All data is systematically stored in the case study database (Appendix II). The database contains for each case the collected interview data on voice recorder and a case study report which combines and summarizes the collected data. The case study database is the input for the analysis.

### 3.1.3 Phase 3 Data analysis

The analysis of case study evidence is performed through a within-case analysis and cross-case analysis. The within-case analysis consists of summarizing and combining the findings of collected

data from the case study report for each case. The emphasis is on explaining the role of consultancy with respect to drivers, consequences and influence on development process for the single case.

The cross-case analysis combines the findings of the single cases to find matching or rival patterns by using the replication logic for varying cases. The data will be presented using empty table shells. Through a time series analysis consultancy is related to the development process of the USOs to enable a comparison of the influence of consultancy on the development process of the different cases.

Finally, the study is concluded by relating the results of the case study data analysis to the results of the theoretical study (Eisenhardt, 1989) to test whether the theoretical findings are comparable to the case study evidence.

### 3.2 Quality & limitations

Prior to the actual research the quality considerations and limitations of the research method are discussed.

For case studies construct validity, external validity and reliability are issues that need to be dealt with in order to present a study of sufficient quality (Yin, 2008).

Construct validity is a challenging test in case study research since it cannot be statistically tested whether the operational measure is correct for the concept being studied. To deal with construct validity this case study uses multiple sources of evidence and has experts review the case study report draft (Yin, 2008).

External validity is concerned with the domain to which the findings of case studies can be generalized. Survey research relies on statistical generalizations; the domain to which findings can be generalized is dependent on the sample characteristics and size. Case study research relies on analytic generalization. The investigator strives for generalization of the set of results for a broader theory. In this study external validity is enabled by replicating the findings of one case in multiple cases (Yin, 2008).

The reliability of a measurement instrument is defined in terms of repeatability. If the study on the same object is repeated by another investigator, the results should be the same (Van der Velde et al., 2004). The reliability of a case study is threatened by the persons involved in the study. To enhance reliability in a case study research documentation of the followed procedures is important (Yin, 2008). In this study the issue of reliability is covered by a case study protocol which is a guide through the data collection. Besides data collection, data analysis is prone to lack repeatability since many conclusions are based on interpretation of the investigator, therefore, to increase reliability a case study database is created prior to analysis (Yin, 2008). The database covers all data collected such as interview recordings and collected documents.

Although care is taken to achieve a high quality study, some limitations have to be dealt with.

Inherent to conducting a case study is the lack of statistical generalizations. This study primarily depends on analytic generalizations. The area to which the findings can be generalized is therefore likely to be interpreted differently by different investigators (Yin, 2008).

Another limitation on the generalization of results is created by the selection of cases. None of the selected USOs is founded on intellectual property (IP) rights owned by the university or incubator. As the university and incubator are not shareholders in exchange for licensing IP they can not apply pressure to the entrepreneurial team to adapt the strategy of the USO to their needs. This is a

significant difference to USOs founded on IP rights owned by the university. In this case the university is more likely to be involved with the business strategy and to push for focus on NPD since this will generate revenues through the license fees of the IP rights. Therefore, the results of this study are limited to USOs that do not have a license agreement with the university concerning the IP rights.

Furthermore, practical limitations play a role such as time limits which inhibit longitudinal studies that use observations to establish a detailed image of the development of a USO and the role of consultancy within the development process. Another practical limitation is geographic, due to the limited time available only cases within the Netherlands are studied while the same study conducted in several countries could improve generalizability of the results or show different results.

By working with a case study protocol it is attempted to secure reliability. However, it is not possible to completely rule out factors that influence the respondent's attitude towards the study. Additionally, the interview topics concern events that occurred in the past, this can bias the response of those interviewed as the response may be dependent on the consequences of these events. It should be noted that alternative consequences may have resulted into different responses (Yin, 2008).

Finally, an important limitation to the reliability of the results is the willingness of the interviewed entrepreneurs to share documentation on financial performance, which is an important source of data to strengthen the reliability of the interview results (Yin, 2008).

## 4. Theory development

The study aims to develop a theory that explains the role of consultancy in USOs. In order to interpret the case study findings the first phase is a literature study (Eisenhardt, 1989; Yin, 2008). Rather than providing an overview of the existing literature (Refer to Literature review) this section uses extant literature to gain insight into possible relations between the studied concepts.

The literature study consists of two parts. Section 4.1 explores the sub-question “What are the drivers for USOs to employ consultancy activities?”. Section 4.2 explores the sub-question “When do USOs employ consultancy activities?”. In the final section the findings are combined to show how a theory can be developed through conducting a case study based on the findings of Sections 4.1 and 4.2.

It should be noted that the findings presented at the end of this section do not serve the purpose of being tested through the case study. The objective of this section is to provide some early insights based on theory that will be evaluated in the light of the case study evidence in the Conclusions & Discussion.

### 4.1 What are the drivers for USOs to employ consultancy activities?

The following section discusses the drivers for USOs to employ consultancy activities parallel to NPD activities. No predetermined set of drivers to engage in multiple activities can be derived from literature due to the explorative nature of this research topic. When using case studies to build theory Eisenhardt (1989) argues that identifying specific relations should result from the studied cases. However, some potentially important variables should be specified beforehand with reference to extant literature.

As starting point an analogy is made with literature on the drivers of entrepreneurs to start up a business. Two theories on the drivers to start up a business are dominant: 1) the theory of planned behavior (Ajzen, 1991) and 2) the model of the entrepreneurial event (Shapero, 1987). Taken together these two theories identify the drivers to start up a business to be planning-based or event-based (Krueger et al., 2000).

The motivation of an entrepreneur to start up a business can be based on a plan to pursue a specific goal or consequence. E.g. the motivation to improve economic status is the goal that is pursued by the entrepreneur through starting up a business. The expected consequence, economic status, is the driver to start up a business (Krueger et al., 2000).

The motivation of an entrepreneur to start up a business can be based on an unexpected event as well. E.g. the present job is unsatisfactory and drives the entrepreneur to start up a business. The event, dissatisfaction about present job, is the driver to start up a business (Krueger et al., 2000).

Based on this literature stream it is suggested that the decision of an entrepreneur to engage in other activities than initially intended is driven by planning-based motivation or event-based motivation.

The following section explains the two concepts as drivers to engage in consultancy activities.

#### 4.1.1 Planning-based drivers

A means to stimulate development recognized in literature on corporate strategy is corporate transformation. The corporation with a desire to improve performance or resolve constraints that hamper performance achieves this by deviating from their core activities and engaging in alternative

business activities (Miles, 1997). The corporate transformation is driven by the desired consequence, stimulating business development through improved performance, and thus the desire to improve performance is identified as a planning based driver for the decision to deviate from the core activities of the corporation.

Applying this theory to NPD focused USOs means that consultancy can be regarded as a deviation from the core activity driven by a desire of the entrepreneurial team to stimulate business development or resolve constraints that hamper business development. Therefore, the desire to stimulate business development can be the driver to employ consultancy activities besides NPD activities.

Business development is influenced by internal and external dynamics (Garnsey & Heffernan, 2005). The internal dynamics, derived from the resource based theory of the firm, are resources and capabilities of the firm (Thong, 2001). The external dynamics are the network relations of the firm with the business environment. In order to improve performance and reach sustainable growth a company needs to optimally configure its resources, capabilities and external relations ( e.g.: Aspelund et al., 2005; Arthurs & Busenitz, 2006; Walter et al., 2006).

### **Resources**

Resources are defined as all tangible and intangible assets tied to the firm (Mustar et al., 2006). Different types of resources are identified such as financial, technological, social and human resources (Mustar et al., 2006).

Many scholars agree on the fact that USOs predominantly face financial resource constraints during their initial phases of growth (Lim et al., 2001; Ebben & Johnson, 2006; Clarysse et al., 2007). Capital constraints result in cash shortage that inhibits investments in product development activities and supportive business processes and therefore, inhibits growth and performance of the USO.

Research among 125 technology transfer offices found that access to venture capital was cited as most important resource constraint faced by USOs (Wright et al., 2006). Furthermore, Cooper et al. (1994) state that capitalization influences survival and growth of new ventures.

### **Capabilities**

Capabilities have been broadly defined by the resource based theory as the ability to reconfigure the resource base of the firm (Thong, 2001). Due to this broad definition research is more fragmented and independent scholars have developed frameworks of specific constraints inhibiting business development of new ventures and USOs. A lack of internal capabilities can, like resources, constrain business development for USOs (Thong, 2001).

Shepherd et al. (2000) have defined a lack of capabilities in terms of novelties the USO deals with: Novelty to management and Novelty in production. Novelty to management concerns the entrepreneurial team's lack of business skills, industry specific information and start up experience. Being novel to management constrains the ability to efficiently configure the resources of the firm. These findings are confirmed by Papagiannidis & Li (2005) who researched the effect of a general lack of skills of the entrepreneurial team on new venture performance. Novelty in production concerns the extent to which the production team lacks experience in using the new venture's production technology. Novelty in production constrains the configuration of technology resources (Mustar et al., 2006). As long as the novelties are not eroded, they have a constraining effect on performance of the firm.

Henderson (1999) identified constraints that new ventures suffer from as the liability of newness. Four liabilities of newness were identified. Learning problems is one of the liabilities that constrain the ability to efficiently configure the resources of a new venture. Hence, learning problems are regarded as constraining the capability position. Learning problems are identified by many scholars as an important liability that needs to be overcome in order to improve performance of the USO (Clerq et al., 2006).

### **Business ecosystem**

According to Chesbrough and Spohrer (2004) *"Business ecosystems are formed by large, loosely connected networks of entities that interact with each other in complex ways"*. This definition covers more than the network of a firm, it covers all entities of the external environment with which the firm is in contact. All factors that are related to the external environment of the USO will be grouped by the business ecosystem.

Often new ventures lack access to existing distribution channels (Lim et al., 2001). A lack of distribution channels results in the inability to be supplied and to distribute finished products and constrains the growth and performance of a USO (Bruno et al., 1992). Like distribution channels, new ventures often lack access to marketing channels. The result is that potential customers are not reached and growth is inhibited due to poor sales (Lim et al., 2001).

Identified as one of the liabilities of newness, lack of a stable client portfolio has a constraining effect on the performance of a USO (Stinchcombe, 1965; Henderson, 1999). Furthermore, the results of research by Bruno et al. (1992) indicate that too much reliance on a single client is a threat to the survival of the new venture.

Novelty to market concerns the uncertainty and unfamiliarity of the customer with the new venture (Shepherd et al., 2000). Potential customers are more likely to purchase products from an established organization rather than a novel organization. Delmar & Shane (2004) use the term legitimacy to explain the markets' perceived reliability of the new venture. They show that generating legitimacy enhances new venture performance.

### **Business development & Consultancy**

Both internal and external influences can impede business development of the USO by a constraint resource and capability position or constraints related to the business ecosystem of the USO.

The studies on constraints related to Capabilities and Business ecosystem predominantly regard the constraints as a direct cause for poor performance. However, the consequences of a constraint Resource position are not shared by all studies. A lack of resources can have a direct effect on the performance of a company (Cooper et al., 1994), or a lack of resources can have a constraining effect on Capabilities and Business ecosystem (Lim et al., 2001). Therefore, the Resource position can have a direct influence on performance of the USO and an indirect influence on performance of the USO through the Capability and Business ecosystem position.

The relations between Resource, Capability and Business ecosystem position as they appear from combining previous studies on factors that constrain business development of USOs is provided in Figure 2.

In line with theory on corporate transformation, the desire to stimulate business development through improved performance and growth of the USO may be the driver to deviate from NPD activities and employ consultancy activities. Hence, by stimulating the Resource, Capabilities and Business ecosystem position through employing consultancy activities the USO may intend to



improve business development. The expected influence of consultancy activities on business development (performance and growth) is shown in Figure 2.

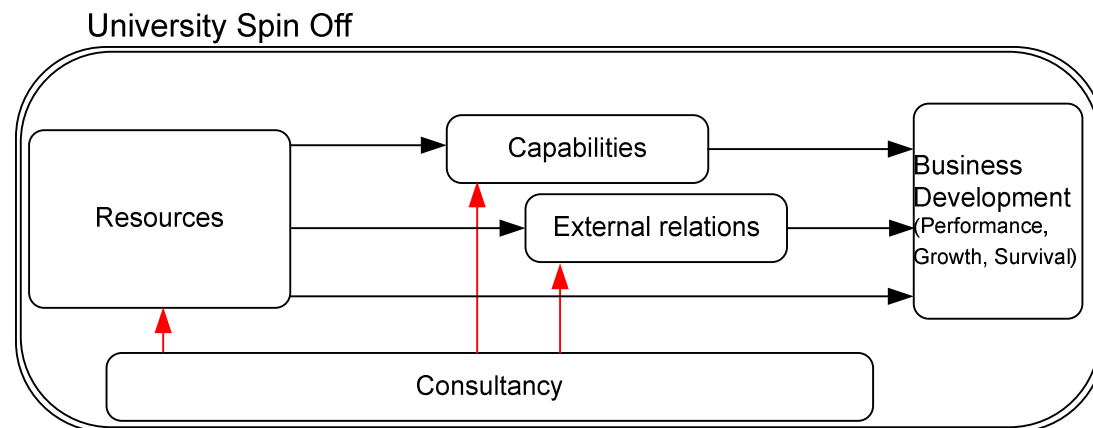


Figure 2: Relation constraints, consultancy and business development

Performance measurement has been subject of debate among scholars since long (Venkatraman & Ramanujam, 1986).

Financial indicators have mainly been used as measure of new venture performance (e.g. Ensley & Hmieleski, 2005). However, financial performance is not always the proper indicator of business performance during early development phases of a spin off (e.g. Lawton Smith & Ho, 2006). More subjective measures are therefore used that enable the research to explore unexpected relations between variables. Due to debates on performance indicators for new venture performance and the explorative nature of this research the scope is limited to studying the influence of consultancy on the Resources, Capabilities and Business ecosystem positions. However, to provide a complete image, the influence of these variables on performance and growth is included in the proposed set of relations in Figure 2.

#### 4.1.2 Event-based drivers

Besides planning-based drivers, an unexpected event can be the driver for an entrepreneur to start a company. Dissatisfaction with the current job position or the opportunity to commercially exploit a business idea are examples of drivers for entrepreneurs to start-up a company (Trocikowski, 2006). In these examples the decision is not only driven by the expected consequence, but by the occurrence of an event that has not been predicted as well.

On the level of the firm unexpected events can occur as well (Söderholm, 2008). The event can have the form of an unexpected opportunity or an unanticipated problem, e.g.: a request by a potential customer for a service that is not yet developed. The decision to offer this service is driven by the occurrence of the event and the expected consequences of offering this service are not anticipated before the event has occurred.

The reaction to this event can take several forms and might stimulate the USO to deviate from the core activity when an opportunity appears that requires the company to do so. Therefore, unexpected events may be drivers to employ consultancy activities with the objective to resolve the problems faced and stimulate business development. Hence, the relations in Figure 2 may be considered when evaluating the expected consequences of employing consultancy activities as a response to an unexpected event.



## 4.2 When do USOs engage in consultancy activities?

To identify when USOs are most likely to engage in consultancy activities, a model that describes the development phases of USOs is required. Furthermore, the potential drivers for consultancy should be linked to the development phases encountered by the USO.

Research on growth patterns of USOs is in a phase where models of growth have been developed, but are not yet empirically tested using a large sample of USOs to confirm the validity of the models (Djokovic & Soutaris, 2008). However, two models of growth patterns for USOs are developed independently and identify similar patterns of development (Ndonzuau et al., 2001; Vohora et al., 2004).

First is the stage gate model developed by Ndonzuau et al. (2001), it identifies four stages of the global spin off process from research results to economic value creation. At each stage a selection process occurs before proceeding to the following stage. This indicates a funneling process of many research results of which a few newly developed technologies succeed as USOs that create economic value. This stage gate approach is created from the perspective of the university with a focus on technology rather than from a perspective of the individual USO with a focus on business development.

The second model identifies five non-linear development phases (Vohora et al., 2004). Within each phase an iterative process takes place to prepare for transition to the subsequent phase.

The transition between the phases is characterized by critical junctures that need to be resolved before the USO can move to the next phase. A critical juncture is defined as: *"... a complex problem that occurs at a point along a new venture's expansion path preventing it from achieving the transition from one development phase to the next"* (Vohora et al., 2004). Following from this definition, the transition phases impose a constraint on the growth of the new firm.

The following discusses the five development phases and the four critical junctures. By relating the critical junctures to the planning-based drivers for USOs to engage in consultancy the role of consultancy will be related to the development of the USO.

### 4.2.1 Development phases

Vohora et al. (2004) distinguish five phases that USOs pass through in their development.

The first phase of the startup process of a USO is the research phase, since most USOs emerged from scientific research. This research provides the intellectual property to establish a new venture.

Following the research phase is the second phase of the startup process; the opportunity framing phase. Once the technology is evaluated for technical validity and performance, it is framed within a commercial opportunity.

Having framed the opportunity, the management of the USO enters the pre-organization phase. During this phase strategic plans are developed and implemented. Decisions are taken on what resources and capabilities are required and how to access or develop them.

Once the USO has gained access to resources to start up the business it attempts to generate returns by offering value to customers. This is done during the re-orientation phase by continuously re-configuring resources in order to adapt the strategy to the market needs. The severity of re-

configuration depends on the strategic decisions made during the opportunity framing phase, thus showing path dependency in the growth pattern.

The final phase is the sustainable returns phase. During this phase the USO attains sustainable returns. Reaching this phase is regarded as the fundamental objective of the entrepreneurial team of a USO.

Figure 3 graphically presents the five phases of development and shows the iterative process of reconsidering strategies within each phase.

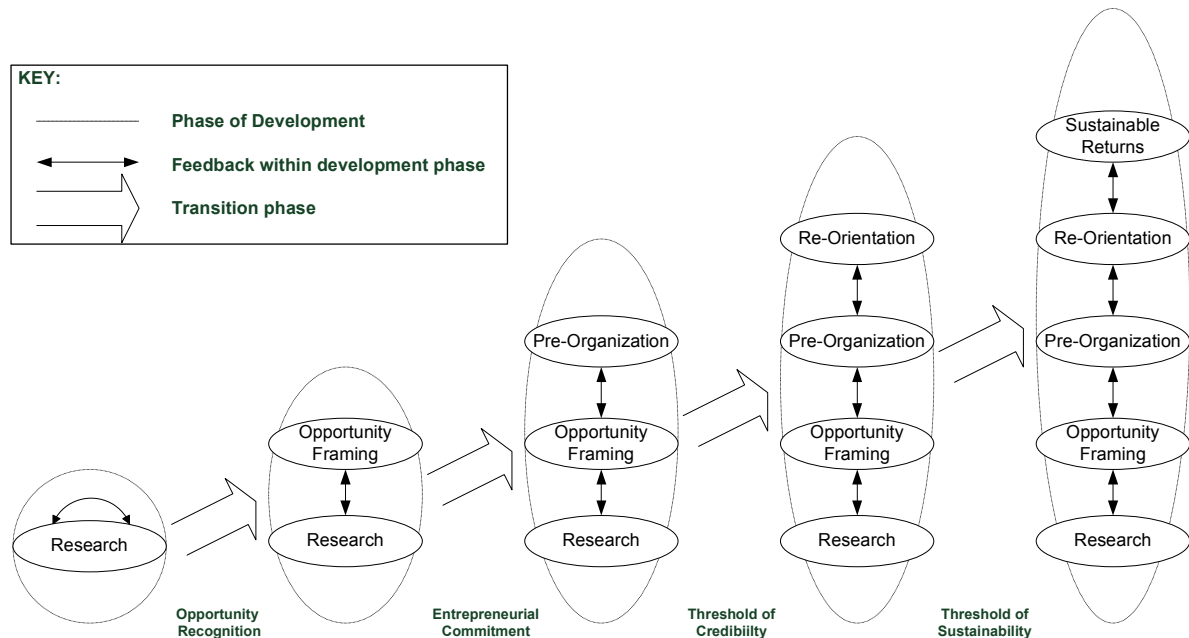


Figure 3: Development phases and critical junctures in the development of university spin off companies

#### 4.2.2 Critical junctures

In order to become an established firm that generates sustainable returns, the USO must successfully make the transitions between development phases. Transition from one phase to the next can only occur when the critical junctures characteristic for the transition are resolved by the entrepreneurial team. The following section discusses the characteristic constraints for each transition phase.

##### *Opportunity recognition*

Opportunity recognition is the match between an unfulfilled market need and a solution to that need. To recognize an opportunity a set of skills is required to gain access to knowledge of the market, of how to serve markets and knowledge of customer problems. Academic entrepreneurs with a technology orientation may lack the skills to gain access to commercial knowledge through enhancing social capital in the form of network interactions. Therefore, growth of USOs can be constraint by lacking knowledge to recognize commercial opportunities.

##### *Entrepreneurial commitment*

Selecting a strategic course requires commitment to the development of the venture by the entrepreneurial team. Entrepreneurial commitment to the venture can be problematic for academic entrepreneurs. First, academic entrepreneurs may be unable to commit to the venture through a lack of prior business experience and unawareness of their abilities. Second, when an academic entrepreneur is not able to fully commit to the venture, acquiring a surrogate entrepreneur is a

challenging task for technology transfer office of the university. In case entrepreneurial commitment is lacking the pre-organization phase cannot take off and therefore, development of the USO is hampered.

#### *Threshold of credibility*

New ventures have no track record when starting a business. The result is that new ventures have a lack of legitimacy. This lack of legitimacy constrains the USOs ability to attract required financial resources as seed capital. In the transition between the pre-organization and re-orientation phase seed capital is a key issue to be able to set up the venture and transform from a concept into a business. In order to acquire seed capital the firm has to be made investor ready and needs to generate legitimacy and establish a reputation.

#### *Threshold of sustainability*

The ability to re-configure existing resources, capabilities and social capital with new information, knowledge and resources is required to generate returns that will sustain in the future and are not yet institutional. In order to generate sustainable returns the venture needs to establish an organizational structure that enables scarce resources to be controlled for their rate of consumption. If the USO does not succeed in constantly reconfiguring the resource allocation it risks depleting resources faster than generating sufficient returns and therefore inhibits the transition to the final phase of development.

Figure 3 shows the transition phases between the development phases of USOs.

### **4.2.3 Consultancy**

To answer the question “When do USOs engage in consultancy activities?”, the drivers to employ consultancy (as defined in section 4.1) should correspond with the constraints faced in the transition phases. The following gives some early insights into the possible relation between the drivers to employ consultancy and the development process.

#### *Opportunity recognition*

The transition phase between research and opportunity framing requires the knowledge and skills to recognize commercial opportunities for the developed technology. In the form of network interactions social capital will be enhanced which, in turn, improves the commercial knowledge of the entrepreneurial team.

The lacking capability to improve knowledge has been identified as one of the constraints that are possibly resolved through offering consultancy services to customers. Providing customers with consultancy services improves the knowledge on the needs of the market which may lead to recognizing new business opportunities to be exploited in the future. Therefore, it is expected that consultancy may enable opportunity recognition.

#### *Entrepreneurial commitment*

The transition entrepreneurial commitment is characterized by the personal level of the entrepreneur that faces challenges in committing to the USO or attracting a surrogate entrepreneur that commits to the USO. Since constraints are faced on a personal rather than firm level it is not expected that engaging in new business activities enhances the transition to the next phase.

#### *Threshold of credibility*

To develop from the pre-organization phase to the re-orientation phase the new firm faces a threshold of credibility. In this transition phase two aspects are important; 1) the new firm needs to establish a reputation and credibility in the market and 2) the new firm needs to acquire financial capital to further develop its products.

By engaging in consultancy a USO can establish a track record of customers paying for its expert services. By offering consultancy services the USO has the opportunity to show the competencies in the field of expertise to the market and investors. This results in overcoming the novelty of the market to the new entrant and builds trust of the market and investors.

Furthermore, generating revenues from consultancy can be an effective way to acquire seed capital before venture capitalists are willing to invest due to the early phase of development.

The two main challenges faced in this transition phase may effectively be solved by engaging in consultancy activities.

#### *Threshold of sustainability*

The threshold of sustainability requires the entrepreneurial team to set up an organizational structure to allocate resources to business processes in a dynamic environment. The goal is to achieve sustainable growth of the organization.

Engaging in multiple activities does not necessarily result in sustainable growth. Since marginal costs remain the same when the number of demanded services increases, offering expert services restricts growth to linearity. While increased demand of a developed product generates exponential growth, as marginal costs decrease when the number of sold products increases.

Therefore, consultancy is not likely to be the most appropriate business activity to achieve sustainable growth.

By combining the planning-based drivers to engage in consultancy with the development phases of the start-up process it follows that USOs are most likely to offer consultancy services in the transition phase between pre-organization and re-orientation. Furthermore, consultancy may be an effective means for establishing knowledge of market needs to identify a commercial opportunity in the opportunity recognition transition phase.

### **4.3 Conclusions on theory development**

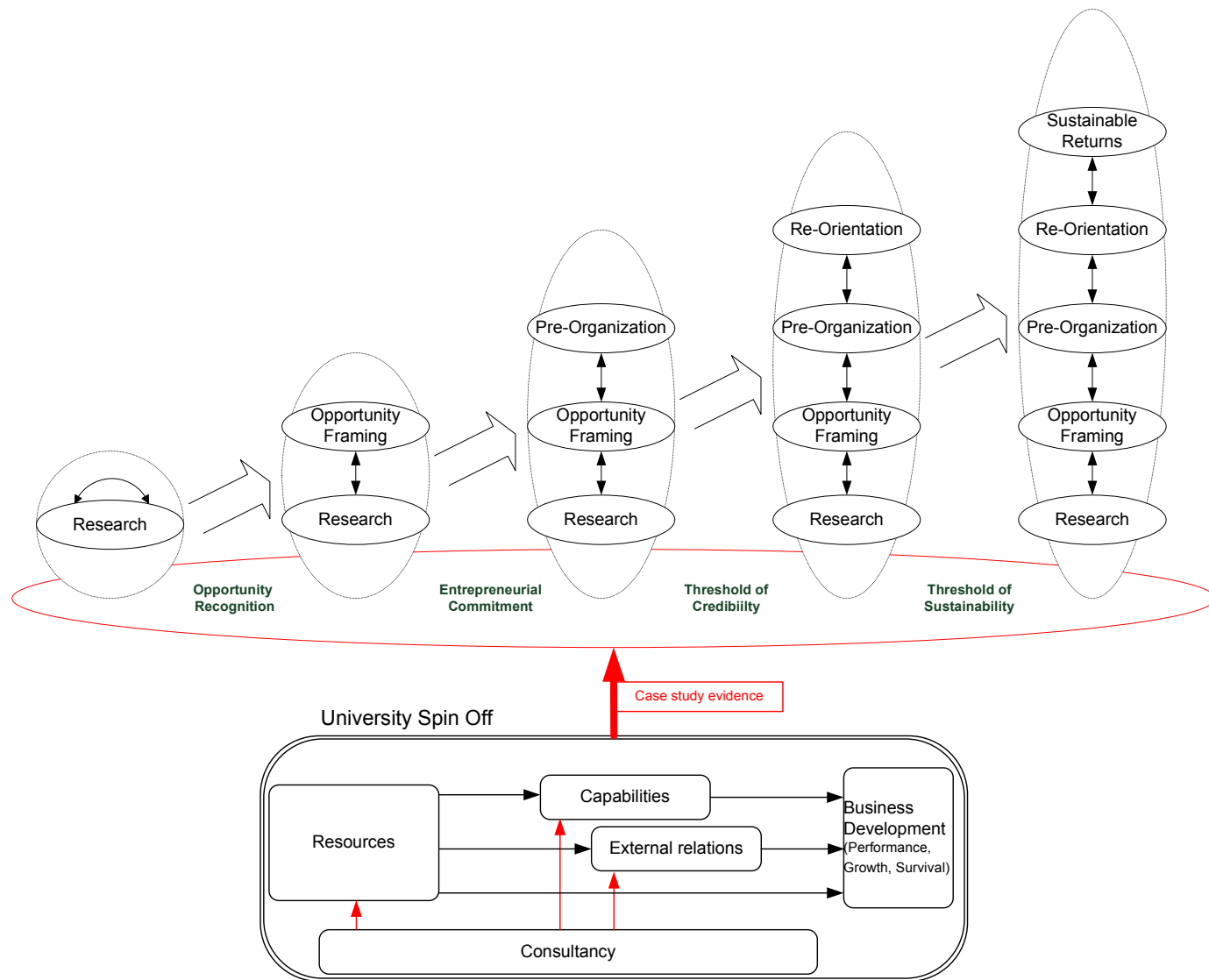
In section 4.1 the drivers to employ consultancy activities are identified based on literature on corporate strategy.

Two types of drivers to engage in consultancy have been identified: Planning based and event based drivers. Planning based drivers follow from the need to improve the resources, capabilities or position within the business ecosystem to stimulate business development and performance. The need can be to overcome constraints or to improve the positive results of one of the aspects. Event based drivers follow from unanticipated events that require a swift change of strategy to safeguard the development of the USO or that present an opportunity that would positively stimulate development of the USO.

Section 4.2 follows with the specification of the development process of a USO. The development process consists of five phases. Within this development process critical junctures should be resolved

to make the transition to the next phase and stimulate development. In the previous section some suggestions are made on how the critical junctures may be resolved through offering consultancy services. It should be noted however, that these suggestions are not based on evidence and therefore cannot serve as propositions.

Therefore, to identify the role of consultancy in the growth process of NPD oriented university spin offs we should find out how the drivers to employ consultancy activities are linked with the development process of the university spin off. This link is illustrated in Figure 4.



**Figure 4: Theoretical propositions, drivers for USOs to employ consultancy activities**

Through data collected by the case studies the link between the drivers and the development process can be defined. To complete the image, the consequences of employing consultancy activities will be linked to the development process as well.

## 5. Case study evidence

To find evidence that explains how the drivers to engage in consultancy are linked to the development of USOs the following section analyzes 4 cases. The 4 studied USOs started with the core activity of NPD and during the course of development employed consultancy services. The findings of the case analyses are combined and used for the cross case analysis.

### 5.1 Case analysis

In the following the 4 studied cases are analyzed. The business activities of the studied cases are described, followed by a discussion on the drivers and consequences of engaging in consultancy as business activity besides their initial core activity of NPD. Finally, the drivers and consequences are placed within a timeframe by positioning them in the development model of Vohora et al. (2004). An in depth analysis of the case studies is listed in Appendix II.

#### 5.1.1 Actiflow

Actiflow started with the objective to develop a system based on boundary layer suction to improve aerodynamic performance on sports cars and in the future for wind turbines, wind tunnels and sailplanes. The consultancy activities exploit the expertise knowledge of the company on airflows. Consultancy projects include assisting customers on optimizing aerodynamic design and performing contractual product development.

The motivation to engage in consultancy is event based; a request to assist in simulating the airflow around a lorry with the objective to create insight into high drag contributions. The driver to grant the request was the opportunity to generate cash flow before revenues are generated from product development.

The consequence of this opportunity is an improved resource position, as was expected by the management team of Actiflow. The consultancy projects have generated early revenues for the company before revenues from license fees were generated.

Furthermore, knowledge of unknown markets and technologies has improved as the company broadens its focus to other industries. This improved the capability position which has lead to recognition of new opportunities for future NPD. Another unanticipated consequence is the attainment of a lead-user in the application of boundary layer suction for wind tunnels through a project that initially started as a consultancy project.

However, besides the consequences that stimulate business development, consultancy has shown to potentially hamper performance and growth. For example through running the risk of giving away commercial opportunities in contractual product development and by entering a low risk comfort zone that may result in a situation with a single focus on consultancy and a minor role for new product development.

The company started consultancy in the transfer phase from pre-organization to re-orientation. The consequences are observed within the feedback of the re-orientation phase. On the long term Actiflow will attain its consultancy activities parallel to new product development activities with the objective to positively influence the feedback within the proceeding development phases and finance future NPD.

### 5.1.2 DelftDynamics

DelftDynamics started with the objective to develop an operation and control system for unmanned helicopters. This evolved into the development of a complete unmanned helicopter with operation and control system. The consultancy activities are assisting in data collection and processing from the air and assistance in software and hardware design for unmanned aerial vehicles.

Through offering consultancy services a 1 year delay in development of the first helicopter could be financed. Secondly, DelftDynamics expected to learn more from the technical requirements of their potential customers.

It was considered in the business strategy that service activities could be employed to support product development activities when required.

The consequence of this strategy is that DelftDynamics could improve the resource position to bridge an unexpected delay without running into cash flow problems. Another anticipated consequence of employing consultancy activities was to obtain knowledge on technical requirements of potential customers. An unexpected result of the consultancy activities was the high impact on establishing a track record and the influence on the expansion of the relational network.

Furthermore, a project that started as a sequence of consultancy assignments evolved into development and sales of a new product-market combination.

On the other hand negative consequences of the strategy are identified; focusing on consultancy to bridge a financing gap can result in delaying the product development activities. As boundaries of consultancy projects are difficult to define and the projects may exceed their planning, which in turn delays the NPD schedule.

At the end of the pre-organization phase the first consultancy projects were started to finance the delayed product development. The improved resource position was a direct consequence. The other consequences were identified during the credibility juncture and within the feedback of the re-orientation phase. The company engaged in consultancy as a temporary solution to a problem. However, due to the secondary consequences the management team currently considers to continue with consultancy activities parallel to new product development activities.

### 5.1.3 Intespring

Intespring started with the objective to develop a product with a lifting mechanism based on springs, the balance box, to be applied in in-house furniture. The consultancy activities include technological and ergonomic consultancy in the field of lifting in general and in-house architecture. Consultancy projects can overlap with co-development projects of the company with an industrial partner.

In order to survive the period before the market introduction of the balance box by the licensing partner a source of revenues other than license fees was required. The unanticipated need for cash flow was the driver for Intespring to engage in consultancy activities.

The main result is that Intespring was able to survive the period prior to market introduction of the balance box by improving its resource position. Besides the increased cash flow the company has identified unanticipated results. The track record of successful consultancy jobs has improved the credibility of Intespring as experts in the field of lifting with springs. Furthermore learning of new



markets and recognition of opportunities for future product development activities are contributions of the consultancy activities.

Due to the lack of a strategic plan that considered a change of focus from product development to consultancy activities the market pull factors of such activities were underestimated. This has led to planning problems and problems to establish a network, which delayed the positive effects of the change of focus. Another consequence is IP conflicts with customers that can arise from unclear boundaries between consultancy and joint product development projects. This may result in contributing to product development for a fixed rate rather than a license fee and thus impede future revenues.

Consultancy was started during the threshold of credibility. Although still on the threshold of credibility, due to the lacking strategy the improved resource position was delayed. The establishment of a track record that contributed to the credibility contributed to the progress towards the re-orientation phase. The improved knowledge of the market due to consultancy activities is observed in the feedback within the re-orientation phase and especially in research and opportunity framing.

### 5.1.4 Quintech

Quintech started with the objective to develop an automatic luggage (un)loading system for airports. Currently this has evolved into the objective to develop a component of the system; the luggage scanner. The current consultancy activities have evolved from very diverse projects to projects in the field of airport handling and logistics.

The cancellation of the main investment by the partner of Quintech forced the company to generate cash flow in a short term to survive. The company was not prepared for this scenario and reacted by doing diverse consultancy projects for low fares in order to improve the resource position in a short period.

The first consequence noticed is sufficient cash flow generated through the service activities to survive on the short term. After a period of 6 months the consultancy projects focused on airport handling and secondary consequences were identified. Through increasing the network of relations new customers were attracted for future consultancy projects. Furthermore, increasing the knowledge of the market and its products may lead to recognition of opportunities. And the track record of consultancy projects generates credibility as experienced consultancy company. Quintech indicated that the credibility as being a consultancy company can impede the credibility of being a product development company. Furthermore, a consequence of a consultancy division that supports the rest of the company is the threat of demoralization to continue product development efforts. A low motivation to maintain a high pace of NPD has a negative effect on the growth potential of the company.

During the pre-organization phase the first consultancy projects were started. During this phase diverse consultancy projects have contributed to the survival of the company. The company is still in the process of overcoming the threshold of credibility. Due to the full focus on consultancy activities the established credibility is mainly reflected on the consultancy activities rather than the product development activities and therefore hindering the transition to the re-orientation phase.



## 5.2 Cross-case analysis

The research topics of this study are the drivers for USOs to engage in consultancy activities and the consequences of engaging in consultancy activities. The research has studied these topics for four USOs in the previous section. To gain insight in matching or conflicting patterns the following table discusses the drivers and consequences for the studied cases and positions them in the development process of a USO. Table 2 combines the results of the individual analyses. Based on Table 2 the case study evidence on the drivers and consequences of consultancy activities are discussed.

Table 2: Cross-case analysis

Case	Event / Planning based	Drivers	Development phase	Consequences	Development phase
Actiflow	<u>Event:</u> Customer request for consultancy services during a period of overcapacity	<u>Resources:</u> - Generate early cash flow	- Threshold of credibility	<u>Resources:</u> - Increased cash flow <u>Capabilities:</u> - Knowledge of markets - Opportunity recognition <u>Business ecosystem:</u> - Credibility through establishing a track record <u>Other:</u> - Giving away commercial opportunities - Adopt low risk and low growth strategy - Attainment of lead-user for new products	- Threshold of credibility - Re-orientation - Re-orientation - Threshold of credibility - Re-orientation - Re-orientation - Re-orientation
DelftDynamics	<u>Planning:</u> Business strategy considered NPD as core activity to be complemented by service activities	<u>Resources:</u> - Cash flow to finance delayed product development <u>Capabilities:</u> - Knowledge on customer requirements	- Threshold of credibility  - Threshold of credibility	<u>Resources:</u> - Cash flow to bridge period of delay <u>Capabilities:</u> - Knowledge on customer requirements <u>Business ecosystem:</u> - Credibility through establishing a track record - Expansion of relational network <u>Other:</u> - Consultancy projects that evolve into new product development - Planning problems of consultancy projects delay product development	- Threshold of credibility - Re-orientation - Threshold of credibility - Threshold of credibility - Re-orientation - Threshold of credibility

Table 2: Cross-case analysis (continued)

Case	Event / Planning based	Drivers	Development phase	Consequences	Development phase
Intespring	<u>Event:</u> Unanticipated need to survive period before market introduction of the Balance box by licensing partner	<u>Resources:</u> - Generate cash flow prior to market introduction	- Threshold of credibility	<u>Resources:</u> - Sufficient cash flow to survive <u>Capabilities:</u> - Knowledge of markets - Opportunity recognition <u>Business ecosystem:</u> - Credibility through establishing a track record <u>Other:</u> - IP conflicts due to unclear boundaries between consultancy and joint development projects - Planning problems delaying NPD	- Threshold of credibility - Re-orientation - Re-orientation  - Threshold of credibility  - Threshold of credibility  - Threshold of credibility
Quintech	<u>Event:</u> Retreat of main investor jeopardized survival	<u>Resources:</u> - Generate cash flow	- Pre-organization	<u>Resources:</u> - Sufficient cash flow to survive <u>Capabilities:</u> - Knowledge of the market and its products <u>Business ecosystem:</u> - Credibility as consultancy company through establishing a track record <u>Other:</u> - Demoralization to sustain product development efforts due to success as consultancy company	- Pre- organization  - Threshold of credibility  - Threshold of credibility  - Re-orientation

### 5.2.1 Drivers

The main driver for the studied USOs to engage in consultancy is to generate an early cash flow with the objective to improve the resource position of the company. Besides, one USO indicated that generating cash flow was the primary driver and improving the knowledge on customer requirements was a secondary driver with the objective to improve the capabilities position of the company.

All companies that were motivated to employ consultancy activities with the objective to improve their resource base did not consider consultancy as business activity before the actual event that initiated the shift of focus. One company planned offering services as business activity in their initial business plan. This is the only company that was aware of secondary consequences such as improving the capabilities position before employing consultancy activities.

For all USOs except Quintech the consultancy activities served to bridge a period between final stage of product development and first revenues from market introduction. Actiflow had finished development of the product and the overcapacity was used to employ consultancy activities; DelftDynamics had a paying customer and financed delays in development through offering consultancy services and Intespring had nearly finished product development and required a cash flow to finance the period upon market introduction by their licensing partner. Quintech, however, engaged in consultancy activities in an early stage of product development when no prototype was developed yet. Due to cancellation of the main investment Quintech was forced to find a means to survive in the short term. In the Figure 5 below it is shown that three out of four USOs changed their focus from NPD to consultancy in the transition phase between Pre-organization and Re-orientation. One USO changed focus in an earlier phase of development, during the Pre-organization phase.

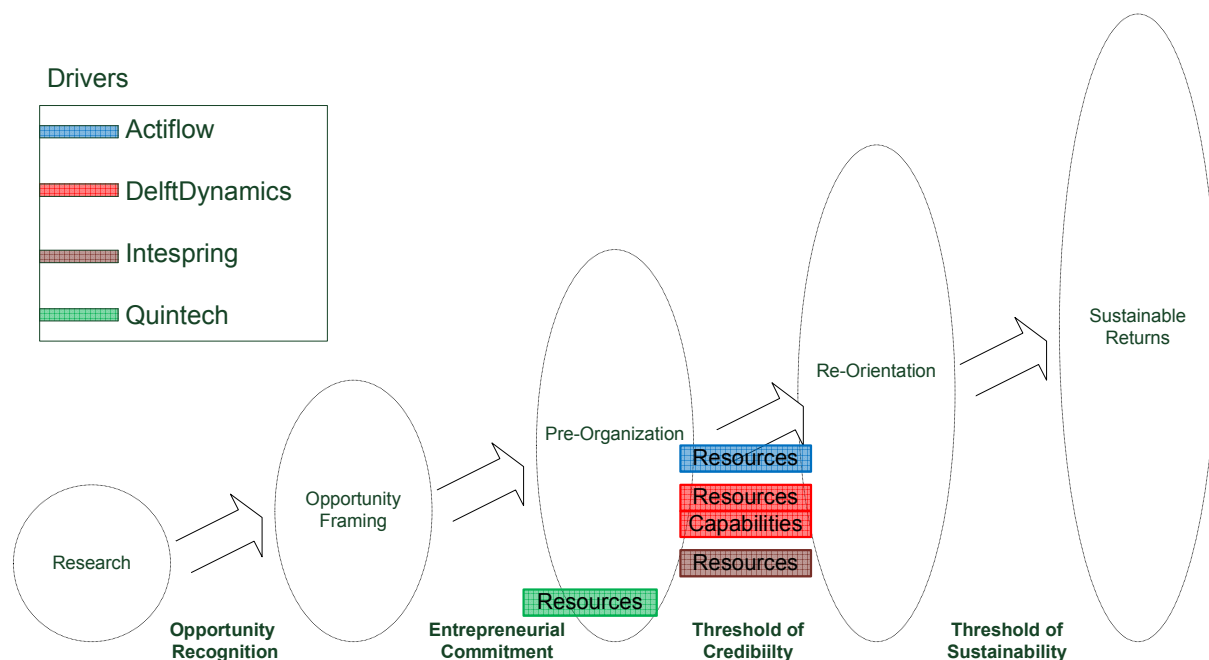


Figure 5: Drivers for consultancy

### 5.2.2 Consequences

In all cases the primary driver to offer consultancy services was to improve the resource base of the company by generating cash flow through consultancy projects. Although the type of consultancy

projects differ from unrelated to highly related to NPD activities the main result of the focus shift was an improved resource base. Due to the improved resource base Actiflow, DelftDynamics and Intespring managed to finance a period prior to market introduction without requiring additional external investments and Quintech survived after the cancellation of the main investment. Currently, the revenue from sales of consultancy services is 75% or more of the total revenue for all studied USOs. Although the four cases expect to generate revenues from their developed products in the coming year, the prospect is that the revenue share of consultancy will remain 50-80% of total revenues and therefore, will substantially contribute to the resource base of the companies in the future.

Besides the consequences that are in line with the expectations of the management teams, several unexpected consequences are apparent for all studied USOs.

Although only one USO indicated that improving knowledge of the market was one of the drivers to engage in consultancy, all studied USOs indicated learning from the market as an important result of offering consultancy services. By learning from the market new opportunities for future NPD are recognized. Learning from the market and recognizing new opportunities leads to an improved capability position. This has its impact within the feedback process of the re-orientation phase (Figure 6).

Before engaging in consultancy activities none of the studied USOs had expected the establishment of a track record and an expansion of the network of relations.

By establishing a track record of successful consultancy projects three USOs indicate that this has a positive effect on the reputation of the USO as reliable new entrant in an industry. This has resulted in increased credibility rewarded by the network of relations and an improved position within the business ecosystem (Figure 6).

Besides the consequences directly related to resources, capabilities and the business ecosystem other consequences of consultancy activities were observed within the studied cases.

In two cases a consultancy project evolved into the development of a new product which was related to the core technology of the company. Actiflow attracted a lead-user in the wind tunnel industry for a new application of boundary layer suction and DelftDynamics developed a control and operations unit for a flight simulator. Both projects started as a consultancy project and lead to the development and sales of a new product. Although this may not be a general consequence of consultancy activities, it shows the possible evolution of a consultancy project into a NPD project.

Furthermore, some consequences of engaging in consultancy have hampered development and growth of the USOs.

First, through consultancy services contractual product development can be requested by customers. For one case this has lead to a missed commercial opportunity that could have been exploited by the USO instead of on a contractual base for a customer. Another USO indicated that the boundary between contractual product development and joint product development can be unclear, resulting in IP conflicts at the end of a project. Therefore through engaging in contractual product development commercial opportunities can be missed. Missed commercial opportunities can impede development of the USO (Vohora et al., 2004). It cannot be stated that this is a general consequence since in two out of four cases this has been identified. However, the company risks to exchange exploiting commercial opportunities with high growth potential for low risk/low growth activities like contractual product development.

Second, due to little experience in consultancy projects, one case has suffered delayed NPD due to the inability to define the boundaries and scope of a consultancy project that lead to delayed schedules of NPD due to optimistic planning of consultancy projects.

Third, in all studied cases consultancy has been the most profitable business activity and in some cases it fully supports the NPD activities. Realizing this it may motivate the entrepreneur to adopt a strategy in which consultancy is the core activity and NPD is a side activity. Chances of high growth due to successful NPD decrease and a stable growth of non-scalable consultancy services is most likely. This limits on the one hand the growth potential of the company; on the other hand the company finds itself in a comfort zone of stable growth and low risks.

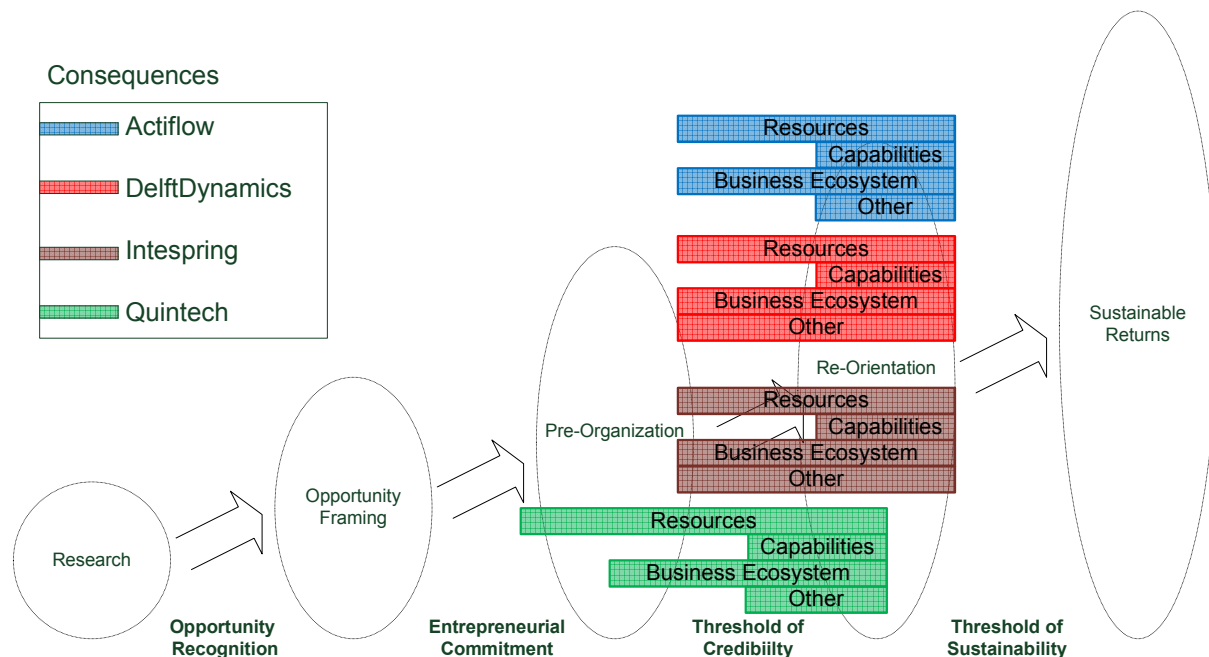


Figure 6: Consequences of consultancy

### 5.3 Conclusions on case analysis

The role of consultancy for four USOs has been studied. For all USOs the main driver to employ consultancy activities was to improve the resource position during a cash constraint period. The consequences of this strategic change, however, go beyond the expected consequences. All USOs indicated besides the main consequence of an improved resource position to have experienced other consequences related to the capabilities of the USO and the position of the USO within the business ecosystem. Furthermore, some USOs experienced other unexpected consequences like consultancy projects that evolve into NPD projects or delays in NPD due to optimistic planning of consultancy projects.

Referring to the selection criteria described in Appendix I: Case study protocol some conclusions on the different characteristics of the cases in relation to the role of consultancy for these cases are drawn.

First, there is no clear evidence found that funding by external capital has influenced the role of consultancy in the USOs, as there are many similarities between two USOs that are not funded by external capital and the USO that is funded by external capital.

Second, the similarities of the results do not show evidence that the sector in which the USO operates influences the results of employing consultancy as business activity besides new product development.

Finally, it is seen that the relatedness of consultancy projects to new product development projects has influenced the consequences of consultancy for the development of the USOs. The case that did employ consultancy projects that were completely unrelated to their NPD projects has gained credibility as consultancy focused company rather than NPD focused company.

## 6. Conclusions & discussion

### 6.1 Conclusions

The previous sections explored the following set of research question and sub-questions:

***What is the role of consultancy in the growth process of new product development oriented university spin offs?***

- 1) What are the drivers for a new product development oriented USO to employ consultancy as business activity?*
- 2) When do new product development oriented USOs employ consultancy activities?*
- 3) What are the consequences of employing consultancy for the university spin off?*

Early insights into the role of consultancy in the growth process are created through a literature study. The literature study identified potential drivers for a USO to employ consultancy and in what development phase the USO would be expected to employ these business activities. A case study among 4 USOs is conducted to provide insight in the actual drivers and consequences of consultancy as business activity as they are experienced in practice.

The following discusses the results of the case studies and answers the three sub-questions. Finally the role of consultancy in the growth process of manufacturing oriented USOs is explained based on the case study results.

*1) What are the drivers for a new product development oriented USO to employ consultancy as business activity?*

According to the findings from Theory development it was suggested that USOs would be driven by a desire to stimulate the development by improving the resource position, capability position or the position within the business ecosystem.

From the case study evidence it follows that USOs are primarily driven to employ consultancy to improve their resource position. The results show that most USOs have not planned to employ consultancy activities beforehand. Rather an unanticipated need to improve the resource position of the company appeared to be the main driver to engage in consultancy.

One case did plan beforehand to employ consultancy activities. This was the only case that, besides the primary motivation to improve the resource position, was motivated as well to improve the capabilities position. None of the other cases expected consultancy to influence the capability position and the position within the business ecosystem significantly.

*2) When do new product development oriented USOs employ consultancy activities?*

From the four cases three USOs show a similar pattern in employing consultancy activities.

The product development trajectory was near to completion for these three USOs when they first offered consultancy services. Three USOs were in the transition from pre-organization to re-orientation at the time of the first consultancy services offered to customers. These results are in correspondence with a suggestion derived from theory; it was suggested that USOs employ consultancy to improve the resource base in order to resolve the threshold of credibility.

*3) What are the consequences of employing consultancy for the university spin off?*



According to the expectation of the entrepreneurs, the main consequence of employing consultancy as business activity is the improved resource position. For all studied cases consultancy is the main revenue generator before revenues from license agreements have taken off. In all cases, due the urgent need for cash flow, the results were apparent shortly after the decision was made to change the focus. Therefore, the improved resource position as consequence of consultancy activities generally appears in the transition phase from the pre-organization to re-orientation.

Besides the consequences that were anticipated by the USOs, the studied cases identified similar patterns of unanticipated consequences. All cases indicate that the position within the business ecosystem was affected by their consultancy efforts. The most important consequence for the business ecosystem is the gained credibility as a reliable USO through the establishment of a client portfolio. For three USOs the credibility of their NPD was improved due to the track record of consultancy projects. However, for one USO the credibility of being a consultancy company threatens the credibility of being a NPD focused company. Furthermore, the USOs indicate to have gained better access to marketing and distribution channels which has strengthened their position within the business ecosystem. The consequences for the business ecosystem were first identified during the transition from pre-organization to re-orientation.

Although one case indicated to expect learning from the market needs as a result of employing consultancy activities, in all cases the knowledge of the market and its products are among the consequences of their consultancy activities. By engaging in external focused activities besides NPD activities with a strong internal focus the company is more open to learn from the market. These learning experiences have led to several newly recognized opportunities for future NPD. The improved capabilities position as result of the consultancy activities is recognized in the opportunity framing phase within the feedback of the re-orientation phase (see Figure 6).

Some consequences were not considered beforehand, but did appear to be the result of consultancy activities. Planning problems can emerge due to the more complex organization of a company which is structured to focus on a single business activity but engages in both internal and external focused activities. The lack of experience in consultancy projects makes the consultancy teams prone to exceed planning; this may have an effect on the NPD schedule. Furthermore, IP conflicts can arise as result of the vague boundary between contractual product development projects and joint development projects with partners. Some partners rather engage in contractual product development, this decreases the chances of high revenues from license fees which can be charged when engaging in joint development efforts. Another negative consequence may be the demotivation to sustain NPD when consultancy projects are financing NPD projects with high risks and low probability of success. A moderated version of this consequence may be that the balance of business activities shifts from NPD as core activity to consultancy as core activity with NPD as side activity. This results in a low risk/low growth profile (Feesser & Willard, 1990).

Finally, it was seen that a consultancy project may evolve into a NPD project with a paying customer or lead user. In two cases a customer that initially ordered a consultancy project increased the scope of the project resulting in its evolution into a longer term product development project. This indicates interaction between results of external focused activities with internal focused activities.

***What is the role of consultancy in the growth process of new product development oriented university spin offs?***

A conclusion of this study is that manufacturing oriented USOs usually are driven by the need to increase the cash flow and improve their resource position in a short term and do not plan ahead to

employ consultancy activities. The need for financial resources is identified as a dominant constraint for USOs in their startup phase (Lim et al., 2001; Ebben & Johnson, 2006; Clarysse et al., 2007). This need is faced by most USOs in the transition phase from pre-organization to re-orientation when product development is near completion (see Figure 7). Vohora et al. (2004) indicate that this transition is characterized by a continuing need to acquire seed capital.

Besides the primary result of an improved resource position, USOs experience consequences for their capability position and their position within the business ecosystem they had not anticipated before employing consultancy activities. The capability position is improved due to learning; this has its effect on the recognition of new opportunities within the feedback of the re-orientation phase (see Figure 8). Learning is regarded as an important factor in efficiently configuring resources of a new venture and stimulating development (Clerq et al., 2006; Henderson, 1999). The study has shown that this can be achieved through engaging in consultancy activities. Due to generating legitimacy, the USOs improve their position within the business ecosystem. The legitimacy can have effect on credibility as NPD focused or consultancy focused company. The uncertainty and unfamiliarity of the customer with the new venture threatens credibility of the company (Stinchcombe, 1965; Shepherd et al., 2000; Delmar & Shane, 2004). This study shows that this lacking credibility can be partly resolved by adopting an external focus and getting in contact with the market through offering consultancy services besides adopting a single internal focus on NPD activities. The result of the increased credibility is apparent in the transition from pre-organization to re-orientation (Vohora et al., 2004) (see Figure 8). However, some negative consequences of consultancy are identified that may impede future business development such as frictions between schedules of consultancy and NPD projects and the risk of gradually shifting the balance from NPD as core activity towards consultancy as core activity of the USO with NPD as a side activity. Finally an unanticipated result is the possible evolution of a consultancy project into an NPD project. This stimulates the chances of successful product development.

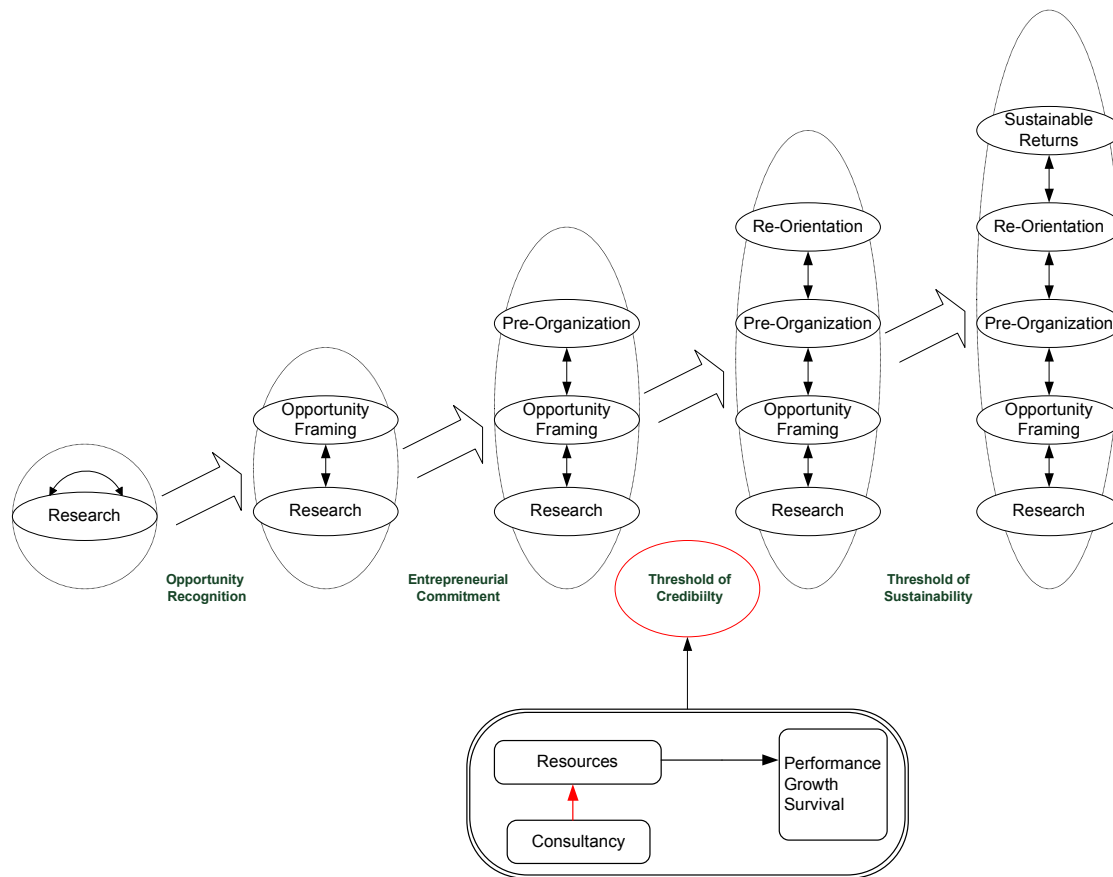


Figure 7: Drivers for consultancy

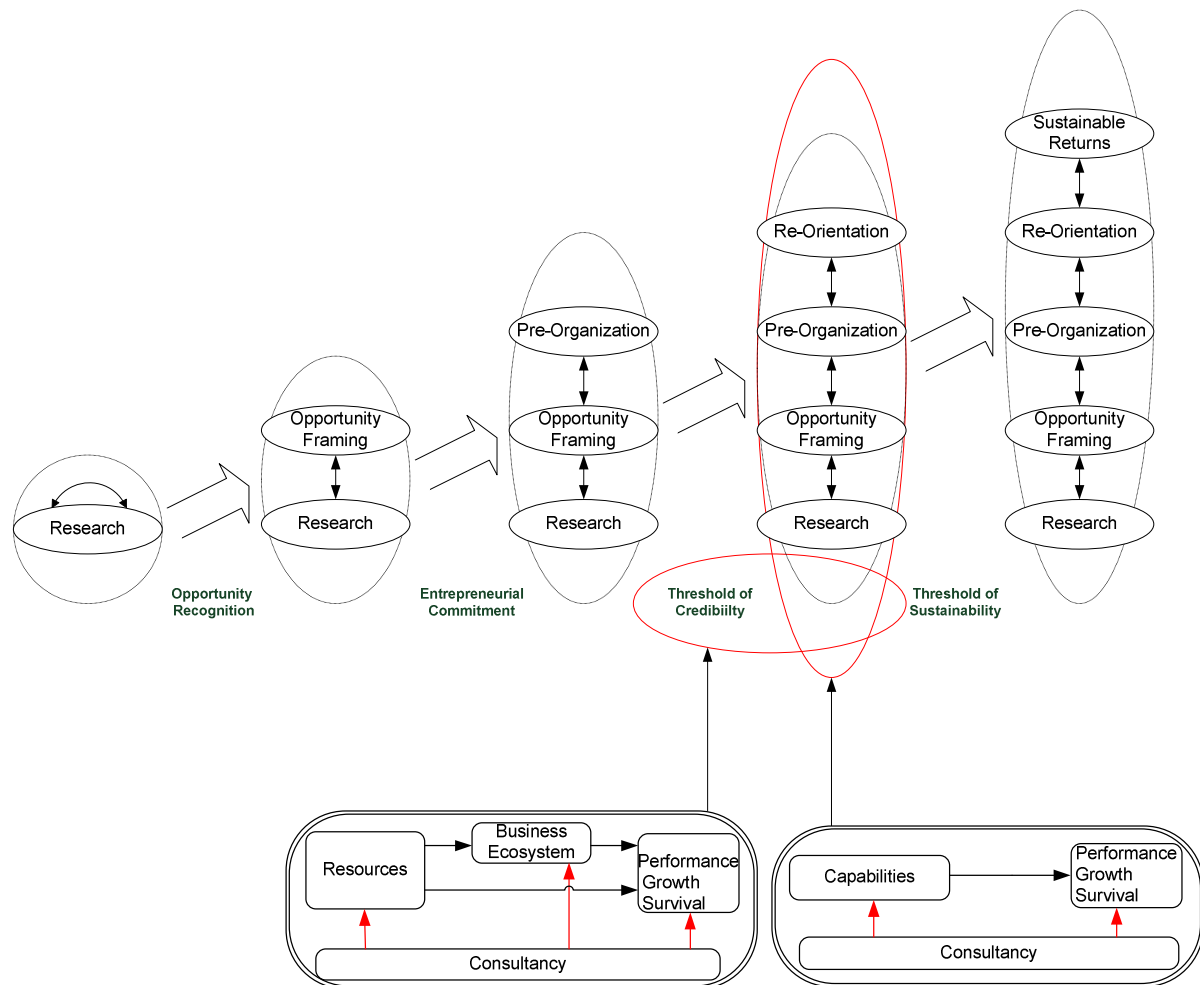


Figure 8: Consequences of consultancy

For a company to be successful it should strive for a balance between alignment to create value on the short term, and adaptability to recognize opportunities for the long term (Raisch & Birkinshaw, 2008). This balance can be influenced by employing both internal and external focused business activities (Birkinshaw & Gibson, 2004). From the study it followed that the USOs primarily employed consultancy activities to increase cash flow, and thus stimulated value creation on the short term. This would imply that through adopting external focused business activities the balance will shift towards alignment. Although it was not anticipated, by employing consultancy activities besides NPD oriented activities new opportunities are recognized that have potential to stimulate future business development and therefore stimulate adaptability. These results indicate that ambidexterity can exist in USOs. It is concluded that by employing multiple business activities a new factor is introduced that influences the balance between alignment and adaptability.

## 6.2 Discussion

The results have been presented in the above. Finally, the results of the research are discussed. The discussion on the research is divided in two topics: contributions of this research to the literature, and recommendations for future research projects.

### 6.2.1 Contributions

Despite the increasing popularity of commercializing research results through university spin offs, the understanding of startup processes and strategies of USOs has remained limited (Clarysse et al.,

2005). The balance between different business activities employed by the USO is an example of a strategic aspect of which little is known (Mustar et al., 2006).

This research contributes to the understanding of the balance between different business activities of USOs by providing insights into the role of internal and external focused business activities within one USO. The following discusses what drives USOs to employ external focused business activities besides internal focused activities; what the consequences and risks are of the strategy to employ multiple activities; and how the coexistence of multiple business activities is managed in USOs.

This study has shown that the primary motivation to employ consultancy activities for USOs is to improve their resource base in a cash constraint period. In terms of ambidexterity, by employing consultancy activities the USO intends to improve the daily business results (alignment) and, therefore, influences the balance between alignment and adaptability (Birkinshaw & Gibson, 2004).

The consequences of this strategy to improve the resource base, however, have further implications than just establishing an early cash flow to stimulate daily business results.

By widening the focus at an early phase through consultancy projects a range of positive side effects are identified. Although some risks related to shifting the focus from the core activity to other business activities are identified, the entrepreneurial teams of the studied USOs have managed to balance these business activities. In terms of ambidexterity employing consultancy services in a NPD oriented USO can influence the balance between alignment and adaptability since the consequences of this strategy (e.g.: opportunity recognition) increase the potential of future business results. Hence, it is concluded that consultancy is a means to influence the balance between alignment and adaptability. This indicates that USOs deal with issues described in literature on corporate strategies as ambidexterity (Birkinshaw & Gibson, 2004).

In the following some early conclusions on managing this form of ambidexterity within USOs are drawn.

Formally the USOs separate activities with an internal and external focus within a holding of which one is the NPD group and one the consultancy group to protect the other business activities in case one group has financial problems. One case clearly separates project teams to work either on consultancy or NPD. Through this formal distinction the comparability of results between teams is improved. This USO copes with internal frictions since the consultancy team is financially supporting the NPD team. This may result in dismantling the NPD efforts if the progress made is considered not worth the investments from consultancy revenues to NPD spending. The other cases do not clearly distinguish project teams for consultancy and NPD. This less formal structure seems to stimulate sharing of knowledge, resources and network contacts between different business activities. E.g. one USO indicates that knowledge on airflows created in consultancy projects has given new insights in the airflow simulation for their NPD activities. However, when different business activities intertwine, issues caused in one group can have consequences for other business activities. E.g.: planning problems of consultancy projects affect the NPD schedule.

The case evidence indicates that internal and external focused business activities are best managed by not assigning employees to either consultancy or NPD teams but to keep the organization flexible and assign employees both to consultancy and to NPD teams. It should be considered though that the cases studied have less than 10 full time employees and in larger USO s this flexible organizational structure may be less preferred to a well structured organization.

Furthermore, this study contributes to the knowledge how start-ups overcome the critical junctures in order to make the transition to the next development phase (Vohora, 2004).

Vohora (2004) identifies four critical junctures in the development process of USOs from start-up to a sustainable company: The recognition of a commercial opportunity; commitment to commercializing the opportunity; establishing credibility; and attaining sustainable returns. In his model Vohora identifies the junctures as critical moments at which problems specific to that development phase should be resolved. The model does not give any insights into the means of solving the problems faced at the critical junctures. Hence, this has remained unknown. This study relates the role of consultancy to the development process and shows how consultancy can contribute to stimulate development and resolve the critical juncture threshold of credibility.

Vohora (2004) argues that the threshold of credibility can be resolved by generating legitimacy through the establishment of a track record. The credibility rewarded by investors, suppliers and potential customers will enable resolving the critical juncture in order to progress to the re-orientation phase. Although this was not anticipated in any of the cases, results show that consultancy has contributed to establishing a track record which in turn resulted in credibility. According to one of the entrepreneurs the track record consists solely of consultancy projects that were the only means to establish credibility as reliable USO. Another entrepreneur mentions that the unexpected public rewarding of credibility by a large organization after a series of successful consultancy projects has stimulated development by resolving the threshold of credibility. One of the studied cases however, has established a track record of consultancy projects in an earlier phase of development compared to the other USOs and this has resulted in a reputation as a company focused on consultancy rather than a company focused on NPD with some consultancy activities. By employing consultancy at an early phase of development when NPD is not yet near completion the USO may risk establishing a reputation as a company focused on consultancy while its initial objective was to develop and market products.

Hence, it is concluded that consultancy can stimulate the development of a USO by resolving the threshold of credibility if the USO manages to establish a track record of consultancy projects that generate credibility as NPD focused USO. This may be at risk if the company engages in consultancy activities at an early phase of development before NPD is near to completion.

### 6.2.2 Future research

This study provides some insights into the role of consultancy in NPD focused USOs and contributes to literature on ambidexterity in USOs and literature on the growth process of USOs. Although some leads are given, this study stresses the need for considering more focus on studies on ambidexterity in USOs. Therefore, some suggestions are made for future research into multiple business activities within USOs that resolve some of the limitations of this study and further improve the knowledge in this field.

#### Test propositions in a quantitative study

The framework created in this study is the result of a study among a limited number of cases. To test the validity of this framework it is suggested to select a large sample of USOs with similar characteristics as the USOs studied in this research to provide better insights in the generalization of the research results. By including more variables that potentially influence the relation between consultancy and business development a more complete image of the existing relations will be created.

The study could use a statistical analysis with a sample to be drawn from spin offs of major universities in Europe. The main topics to be addressed are the drivers to employ consultancy and

the consequences of the consultancy activities for the development of the USO. Furthermore, variables that could influence the relation between consultancy activities and development of the USO such as financing structures, external relations and progress of NPD activities should be taken into account.

### **The role of external parties in the strategic decision to employ multiple business activities**

The role of consultancy has been studied in USOs that are not dependent on their parent organization through IP ownership. However, many USOs are dependent on their parent organization in commercializing research through IP rights. In exchange for licensing IP rights the parent organization may take a share in the USO or take a share of profits through license fees. The parent organization benefits most from fast market introduction and therefore may push the USO to focus on NPD and pursue fast market introduction rather than employing other business activities that do not directly stimulate market introduction. It is interesting to have insight in the way USOs that are dependent on a parent organization deal with the possibilities of multiple business activities and how they compare with USOs that are not pushed by a parent organization to have complete focus on NPD.

This research can adopt a case study approach selecting e.g. 6 similar USOs of which three are dependent on a parent organization through a license agreement with shares or license fees and three are not dependent and do not use IP owned by the university as foundation for NPD.

### **Longitudinal study**

This study is conducted at a single point in time due to the limited research period and is therefore limited in its ability to trace changes over time. Furthermore, the data about historic events collected through interviews may be biased by the respondents' selective memory (Van der Velde et al., 2004; Yin, 2008). Therefore, this study analyzed 4 cases that have not yet completed all stages of the development model by Vohora et al. (2004). Data collected from a fifth case that is in the final phase of the development model (Figure 3) has provided an interesting lead for a longitudinal study since it followed from the interviews that the respondent was strongly biased in his response by the current business performance. The changing perspective due to the outcomes of events and decisions made in the past can be taken into account by conducting a longitudinal study. By expanding the research over a period long enough to perform a time series, the evolution of the perceived role of consultancy within the USO can be studied.

For example, longitudinal data can be collected through interviews with key persons involved in the strategic decisions and critical events that are dealt with. Data can be collected in the period from start up until the USO reaches the sustainable returns phase (Vohora, 2004) or surge their operations due to the inability to survive.

### **The influence of employing multiple business activities on performance measures**

This study only provides insight into the drivers and consequences of engaging in consultancy activities. However, due to the limited scope of this research, the influence of the expected consequences on performance of the USO has only briefly been touched. Having insights into the influence of strategic decisions on the performance of the firm the ability to predict the firms performance is improved (Cooper, 1993).

Therefore, future research can focus on the influence of employing consultancy on the performance of USOs. Venkatraman and Ramanujam (1986) suggest multiple levels on which organizational

performance can be measured. It is assumed in this study that performance, growth and survival are influenced by consultancy primarily through other variables (resources, capabilities, business ecosystem).

Coupling the role of consultancy to performance indicators can be implemented in any of the four previously discussed research suggestions.



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## Appendix I: Case study protocol

# Case Study Protocol

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### *The role of consultancy in the growth process of University Spin Offs*

#### **Synopsis**

This document contains the description of case selection criteria, selected cases and discusses methodological considerations. Furthermore, the research topics are described and translated into an interview protocol.

First the research units and units of analysis, University Spin Off; Consultancy and Growth process, are defined. With the definition of these units the case selection criteria can be defined. From the case selection criteria follow the selected cases. The characteristics of the selected cases and required contact information are provided.

The case study methodology describes the data collection procedures and practical issues related to preparation of data collection. The outline of the case study report is provided in this section.

The research topics cover the questions posed to the researcher that need to be addressed to answer the main research question. The research topics are translated into interview questions in the interview protocol.

The purpose of this protocol is to increase the reliability of data collection by offering a tool that guides the investigator to carry out data collection of each single case (Yin, 2008). When similar procedures are used in data collection for each case, (cross) case analysis will be improved.

## Introduction

The objective of this research is to improve the knowledge on the consequences of employing different activities within a USO. First, the research aims to improve the understanding in the motivation of an entrepreneur to engage in consultancy while the initial plan was to develop a product. Second, the research aims to provide some insight in which development phase of the growth process consultancy is most likely to be employed. Furthermore, different types of consultancy will be identified (e.g. consultancy related or unrelated to product development activities). Finally the research aims to explain the consequences of engaging in consultancy activities for a manufacturing oriented USO.

Currently consultancy is perceived by university incubators and technology transfer offices as a weakness that distracts from the core activity of developing a product. This research intends to change this paradigm by indicating the potential value of consultancy in manufacturing oriented USOs and positioning consultancy as element of the growth process of USOs.

## Units of analysis

### University Spin Off

University spin offs are new firms created to exploit knowledge, technology or research results developed within a university (Pirnay et al., 2003).

### New Product Development oriented University Spin Off

New Product Development (NPD) oriented university spin offs are spin offs according to the definition of Pirnay et al. (2003) that are targeted to the development of a new product. The input for development of a new product is knowledge, technology or research results that are developed within the university. This research focuses on USOs that are NPD oriented and started with the primary objective to develop and market a product rather than a service.

### Consultancy

Consultancy is a widespread term being used for many purposes. According to the definition of dictionaries consultancy is *"Giving expert or professional advice"*. Pfirrmann (1999) compared different activities employed by biotechnology ventures and distinguished between manufacturing and consultancy. Consultancy for this purpose is defined by Pfirrmann as *"Selling expert services focused on selling the entrepreneurs academic expertise to address a specific problem for a client"*.

Due to the explorative nature of the research into the role of consultancy in product oriented USOs consultancy will be interpreted in a broad sense. Therefore, this study will use the definition by Pfirrmann (1999) with the note that a vast range of services provided to customers can be included, even if these services are strongly related to the product being developed.

### Growth process

Research on growth patterns of USOs is in a phase where models of growth have been developed, but are not yet empirically tested using a large sample of USOs to confirm the validity of the models (Djokovic & Soutaris, 2008). However, two models of growth patterns for USOs are developed independently and identify similar patterns of development (Ndonzuau et al., 2001; Vohora et al., 2004). The growth process of USOs for this research will be explained by using the model of Vohora et al. (2004).

This model identifies five non-linear development phases (Figure 1). Within each phase an iterative process takes place to prepare for transition to the subsequent phase.

The transition between the phases is characterized by critical junctures that need to be resolved before the USO can move to the next phase. A critical juncture is defined as: *"... a complex problem that occurs at a point along a new venture's expansion path preventing it from achieving the transition from one development phase to the next"* (Vohora et al., 2004).

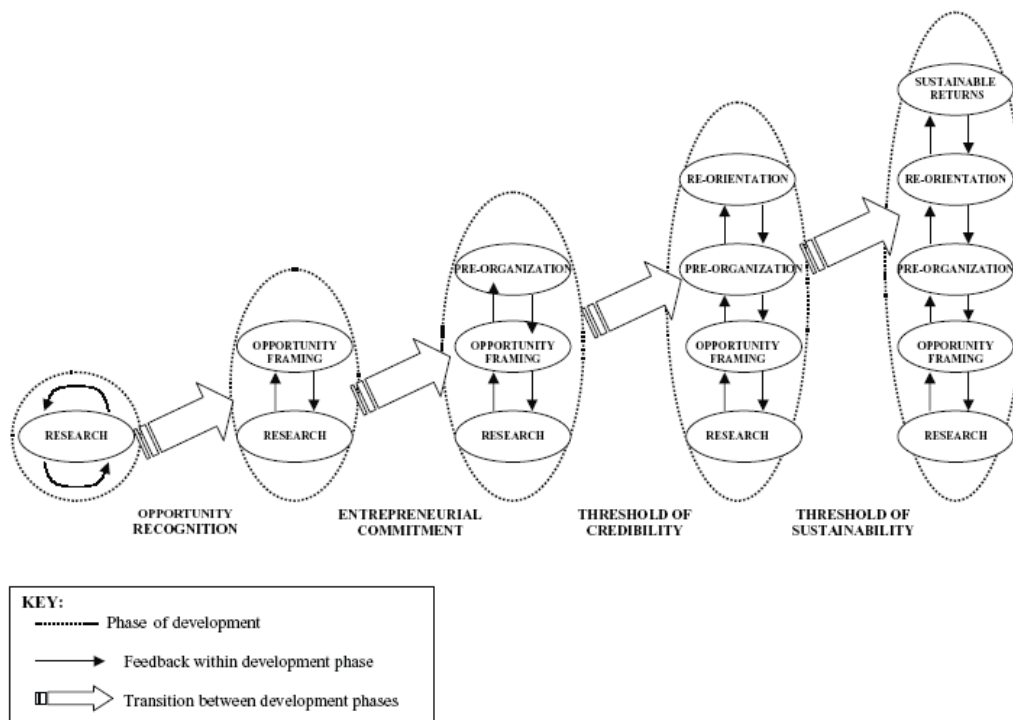


Figure 1: Development process of USOs (Vohora et al., 2004)



## Case selection criteria

When doing a multiple case study, cases should be selected that best fit the theoretical replication design (Yin, 2008). For this research cases need to be selected that fit the proposed frameworks and relations between the units of analysis.

The cases are selected with the characteristics described below in mind. Although it is preferred to select cases that have a seamless fit with the selection criteria, the criteria should be interpreted flexible. Otherwise the risk is that too few cases fit the criteria.

- The selected cases are University Spin Offs according to the definition of Mustar et al. (2006).
- The University Spin Off is established by the entrepreneurs with the intention to develop a product. The business plan describes the main business activity as developing a new product rather than just offering services.
- During the development of the University Spin Off the business activities included offering services as described by the definition of consultancy to customers. In any one of the five phases of development (Vohora et al., 2004) did the USO decide to include offering services to their business activities.
- The University Spin Off should be in the 4<sup>th</sup> or 5<sup>th</sup> phase of development according to the growth model for University Spin Offs by Vohora et al. (2004). When the USO is in a more mature phase of development the consequences of earlier strategic decisions can better be distinguished and analyzed in hindsight.
- The University Spin Off is not necessarily in an incubator of the university or any other organization. To ensure diversity of the cases and to compare the presence of a supportive organization on strategic decisions it is aimed to analyze one USO which has not been supported by an incubator. A practical argument is the relative newness of the incubator; since the foundation of the incubator at the TU Delft not many USOs have reached the 4<sup>th</sup> or 5<sup>th</sup> development phase yet.
- The University Spin Off is or has been funded by external capital. To avoid a bias towards the consequences of strategic decisions made by the entrepreneur several external parties will be interviewed. Capital providers are an important external party in judging the potential of a new venture before investing and are therefore likely to critically review strategic decisions and give unexpected insights in the consequences of strategic decisions.
- From four cases at least two different sectors should be represented. When all cases are selected within one sector generalization of the results among different sectors cannot be defended. Therefore, to achieve at least some degree of generalization of the results at least two different sectors must be represented by the four selected cases.
- There is no limitation to Dutch cases other than time and budget limitations. The case study strategy requires easy access to the cases. Therefore, it is not feasible to select cases situated outside the Netherlands.

- If enough data can be collected unsuccessful University Spin Offs are eligible for this research. By analyzing an unsuccessful USO that engaged in consultancy the risks of this strategy may become more apparent, since these risks are often forgotten when a strategy turned out to be successful.

-Pragmatic criteria such as simple access to key persons (investors, employees, incubator) and availability. Easy access to investors, employees and supportive organizations of the selected University Spin Off contributes to the feasibility of an in-depth analysis with multiple perspectives from involved key persons. Furthermore, the involved key persons should be willing and available to cooperate in the research otherwise the case is not fit to be selected.

## Selected cases

A two stage screening procedure is used to select the 4 cases from the TU Delft.

The first stage is an interview with representatives of YES!Delft about the entire pool of University Spin Offs to select those candidates that fit the first three selection criteria. From this smaller group of candidates the second stage consists of screening the candidates with the remaining selection criteria. The four selected cases are presented in Table 1 & Table 2.

Most USOs from YES!Delft focus their NPD efforts on a sector with a specific technological foundation from the parent organization. The NPD efforts of the four selected cases are all based on a specific technological foundation and focus on a single sector (Table 1).

The consultancy activities, however, are more flexible; the USO can widen the focus and employ consultancy activities in different sectors, and customers can request consultancy projects with a broader technological foundation. The focus on sector and technology is represented in the table below.

The flexibility is taken into account in the selection of the four USOs: One USO represents spin offs that focus their consultancy activities on the same sector and use the same technological foundation as the NPD activities; one USO represents spin offs that do not focus their consultancy activities on the same sector and do not use the same technological foundation as the NPD activities; one USO represents spin offs focus their consultancy activities on the same sector as the NPD activities but do not use the same technological foundation; and one USO represents the spin offs that do not focus on the same sector, but that do use the same technological foundation for their consultancy activities. The four cases that are selected fit the four cells of the table and represent the different consultancy activities a USO can employ (Table 1).

Table 1: Sector vs. Technology

Technology Sector	Focus	No focus
	Focus	No focus
Focus	Intespring	DelftDynamics
No focus	Actiflow	Quintech

Table 2: Selected cases

Company	Sector	Technology	Founding year	Financing	# FTE	Development phase	Main partners	Key persons (interview)
Actiflow	Aerospace	Boundary Layer Suction applied to diffuser of sports car	2005	External investment	7	Re-orientation	YES!Delft Private investor Ferrari	Eric Terry (Entrepreneur) Lesley Fockema (YES!Delft) Toon Stilma (Roland Berger)
DelftDynamics	Aerospace	Unmanned helicopters equipped with sensors	2006	Bank loan	4	Threshold of credibility/ Re-orientation	YES!Delft Rabobank Syntens	Arnout de Jong (Entrepreneur) Lesley Fockema (YesDelft)
Intespring	Home appliances	Lifting system using springs	2005	Licensing partner	5	Threshold of credibility/ Re-orientation	YES!Delft Thomas Regout Int.	Rogier Barents (Entrepreneur) Lesley Fockema (YesDelft)
Quintech	Logistics	Automatic luggage loading system	2006	Licensing partner	9	Threshold of credibility/ Re-orientation	YesDelft Vanderlande Ind. TU Delft	Roel Reijnen (Entrepreneur) Lesley Fockema (YesDelft)

## Methodology

### Data collection procedures

Archived data analysis serves as performance measuring tool that enables analysis of financial performance and can therefore be a simple tool to measure direct consequences of strategic decisions (Venkataram & Ramanujam, 1986). The following is a list of data to be collected if available:

- Turnover (for each business activity)
- Profit
- Invested capital
- Number of employees
- Turnover/employee
- (R&D) Expenditures

It is expected that a financial data analysis will give objective insights in the consequences of engaging in consultancy activities.

Review of business plan. If the business plan has been updated the description of the business activities is analyzed for updated versions. It is expected that the business plan and its evolution will give insight in the core activities and will indicate when the change of focus formally occurred.

Interviews with key persons involved in the development of the company: Investors, incubator (if any), entrepreneur(s). Strived for are 2 to 3 interviews per case. The interviews are semi structured to stimulate unanticipated evidence as result. Furthermore, the interviewer will be aided by a timeline to be completed during or after the interview regarding strategic decisions, consequences and their place in time. Subjectivity of interviews is reduced by interviewing several actors (triangulation) and comparing interview data with objective data such as financial data and business plans. It is expected that the interviews will give insight in the drivers and the consequences of engaging in consultancy activities.

### Preparation for data collection

Prior to visiting the sites for interviews a proper preparation is required. Before interviewing the following preparations should be completed:

- Collect basic information on the company (such as: sector, year of establishment, product group) and on the interviewee (such as: relation with the company).
- Obtain documentation on financial data and business plans if possible before conducting interviews.
- Inform the interviewee in advance on the research background, the concepts and purpose of the interview through sending out the information letter.
- Customize interview protocol and other tools for the specific interview.
- Arrange a proper location and inform participants on time and location of interview.
- Arrange sufficient resources required to conduct the interview (bloc notes, recorder, blank timeline and additional documents).

### Outline of the case study report

- General description of the case
  - Sector
  - Business development
  - Technology development
- Business activities
  - New Product Development
  - Consultancy
- Development phase
- Timeline
- Perspectives on drivers for consultancy
- Perspectives on consequences for consultancy
- Drivers and consequences
- Conclusions

## Research topics

The topics of interest to the case study researcher are described below. The ability to answer these questions indicates the ability to answer the research questions of the research into the role of consultancy in the growth process of University Spin Offs.

### Introduction

Short description of involved technologies, company profile, sector and strategic goals of the company.

### Business activities

What are the core activities according to the initial plan?

Did the core activities change since start-up?

How do activities complement each other?

### Development phase

When is the company established?

In what phase of development does the company find itself?

What were critical events in the transfer from one phase to the next?

### Timeline

When did the USO change the focus/engage in consultancy?

What strategically important events occurred before and after this change of focus?

### Drivers

What is the motivation of the USO to change the focus?

Was the strategic change planned in advance?

Was the strategic change a direct solution for a faced need?

Was the strategic change a direct reaction on an unexpected event/opportunity?

### Consequences

What was the predicted result of the strategic change?

What were the unpredicted results of the strategic change?

In what time span did the results become apparent?

What are the expected long-term results?

What are the potential risks?

What is the effect on intended core activity?

What is the effect on objective performance measures?

What is the effect on subjective performance measures?

### Drivers & Consequences

What is the opinion of external parties on the strategy to engage in consultancy?

On what experiences is this opinion based?

Did the opinion change when results of the strategy became apparent?

Did the strategy affect the relation with external parties?

### Conclusion

Did engaging in consultancy aid the long term development of the company?

Did engaging in consultancy stimulate development of products?

Did engaging in consultancy hamper or stimulate (financial) growth?



## Interview protocol

The following section covers the interview protocols for the interview with incubator YES!Delft, Entrepreneurs and Investors.

### Interview protocol YES!Delft

Interview Lesley Fockema YES!Delft

13-mei-09 08.30 9.00 uur

Introductie

Mening Yesdelft over consultancy

Stellingen

- Consultancy kan de credibility van een starter vergroten
- Consultancy kan het netwerk van een starter uitbreiden
- Door consultancy komt een starter in een comfort zone
- Consultancy is een zwakte bod voor een starter

Starters analyse (per USO)

- Wat was hun motivatie om consultancy te beginnen?
- Wat is het effect op de core business?
- Wat is het effect op de (financiële) prestaties?
- Wat zijn de risico's?
- Staat de incubator positief of negatief tegenover dit specifieke geval?
- Waarop is dit gebaseerd?
- Is de mening verandert naarmate de resultaten zichtbaar werden?
- Is de relatie tussen starter en incubator verandert?

Conclusie (indien tijd over)

- Onder welke voorwaarden kan consultancy ontwikkeling stimuleren?
- Kan consultancy als tool worden ingezet om tijdelijke problemen op te lossen?

### Interview protocol Entrepreneurs

Interview NAAM USO

DATUM & TIJD

Introductie & ontwikkeling

Hoeveel werknemers heeft NAAM USO?

Met welke technologieën en producten is NAAM USO begonnen?

Hoe ver was de technologie ontwikkelt tot een product tijdens het opstarten?

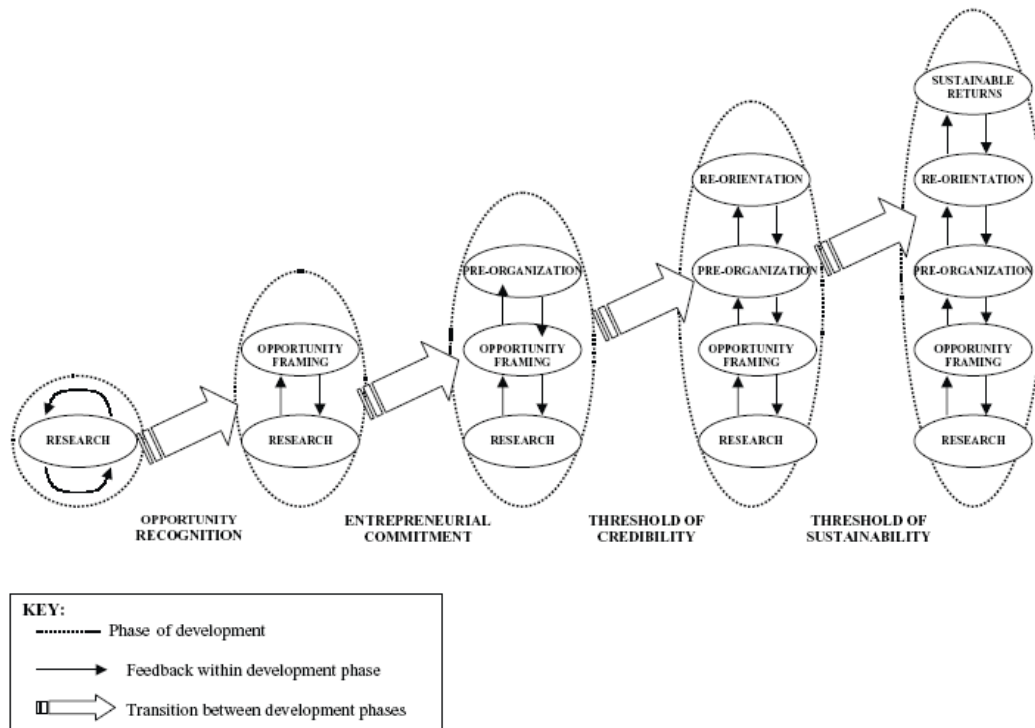
Zijn de hoofdactiviteiten verandert tijdens de ontwikkeling van NAAM USO?

Wat zijn de service gerichte bedrijfsactiviteiten?

Wanneer zijn de eerste producten aan klanten verkocht?

Wordt er gefocused op een specifieke sector?

Er zijn 4 fases van ontwikkeling voor een startende onderneming:



In welke fase bevinden jullie je?

Zijn er moeilijkheden geweest met betrekking tot: opportunity recognition, entrepreneurial commitment, credibility, sustainability?

Consultancy

Wat zijn naast productontwikkeling de bedrijfsactiviteiten?

Hoe vullen deze de productontwikkeling aan? Hoe belemmeren deze productontwikkeling?

Wat voor soorten dienstverlening/consultancy biedt NAAM USO haar klanten?

Welke factoren hebben een rol gespeeld in de keuze om services/consultancy te leveren?

Is NAAM USO consultancy gaan leveren vanuit een behoefte aan deze bedrijfsactiviteiten of de beoogde resultaten ervan?

Is het een resultaat van een onverwachte gebeurtenis?

Consequenties

Wat zijn de voorspelde consequenties van consultancy activiteiten?

Wat zijn de onverwachte consequenties?

Wat kunnen de consequenties op lange termijn zijn voor NAAM USO?

Wat is de invloed van consultancy op:

Omzet

Groei en ontwikkeling bedrijf

Aantrekken kapitaal

Product focus en ontwikkeling

Toekomstige strategien

Marktkennis

Opportunity recognition

Marketing producten/diensten

Credibility

Netwerk van suppliers en (potentiële) klanten

Wat is de grootste bijdrage van consultancy geweest aan NAAM USO?

Worden de consequenties bewust beoordeeld en gebruikt voor toekomstige strategien?

Hoe beoordelen jullie dit effect?

Wat zijn de risico's van consultancy en waren deze bekend voordat werd besloten consultancy diensten te leveren?

Externe partijen

Wat is de mening van externe partijen ten aanzien van consultancy activiteiten?

Investeerders

Incubators

Andere partners (TU, suppliers, klanten en andere betrokkenen)

Waarop is deze mening gebaseerd en is deze verandert?

Is de relatie met deze partijen verandert door het leveren van diensten?

Conclusie (indien tijd over)

Onder welke voorwaarden kan consultancy ontwikkeling stimuleren?

Kan consultancy als tool worden ingezet om tijdelijke problemen op te lossen?

## Appendix II: Case study reports

### Case study report: Actiflow

Actiflow was established in 2006 to develop a product based on boundary layer suction. Boundary layer suction has been extensively researched within TU Delft. If the boundary layer of airflow around an object can remain attached to the surface of the object the aerodynamic performance will be improved. This can be achieved through boundary layer suction. Actiflow intended to implement this technology in the automotive industry and to extend the scope to other industries in a later stage. The company employs 6 FTE and employs students to study potential products and markets for their core technology.

Initially the core activity was to develop boundary layer suction for the automotive sector and to further develop it for other sectors. Since start up the core activity has not remained unchanged. The company now has developed boundary layer suction for an automotive application and has a license agreement with a customer. Besides new product development Actiflow engages in contractual product development projects (E.g. development of a heating blanket for patients during surgery). Furthermore, consultancy activities are employed by Actiflow that exploit the knowledge on airflows. Currently the core activity has shifted from new product development to consultancy.

By doing consultancy projects specific knowledge on the airflow around objects improves. This knowledge contributes to the development process of products. E.g. knowledge of airflow around wheels of a car generated in a consultancy project complements design of the product development which copes with similar airflows.

The core technology was developed before the company started. The commercial opportunity was recognized during entrepreneurial courses for TU Delft students. Therefore, the start up in 2006 represents the pre-organization phase. During the pre-organization phase a lead customer was attracted to start the development of the technology into a product. Currently the product for the lead customer is finished and the re-orientation phase is entered. The company needs to establish a strategy to encourage further growth. Decisions for re-orientation are how to balance NPD and consultancy activities and which sectors to focus on. A major obstacle was the threshold of credibility due to the focus on one customer that required confidentiality no track record could be established.

The request of a customer for consultancy services was the event that led to the change of focus. During this period Actiflow awaited the NPD progress of their licensing partner and had time to employ other business activities. Therefore, the customer request was an opportunity to generate cash flow.

After the first occasional consultancy projects the strategy was adjusted to do more structural consultancy.

The predicted result of consultancy projects was to generate cash flow. However, after the first occasional consultancy projects secondary consequences were noticed as well. An important result is the improved knowledge of unknown markets, recognition of opportunities in new product-market combinations and the attainment of a possible lead user to enter the wind tunnel market with boundary layer suction.

Furthermore, in the long term consultancy should cover the fixed costs and NPD should be financed by consultancy. The preferred strategy for the future is to generate revenues from NPD by licensing. When NPD is finished the overcapacity of employees will serve consultancy projects.

The potential risks were not considered on beforehand since the decision to employ consultancy activities was the result of an unexpected event. In retrospect Actiflow indicates the risk of transferring information and knowledge on projects that cannot be transferred to other projects due to competitive advantages of customers. Another risk is that commercial opportunities are given away to customers through consultancy projects that are in fact contractual product development projects. In these projects Actiflow assists development of a product for a fixed fee and does not bear any risks, however, if the product is a success the company does not receive a license fee. By focusing on these consultancy projects a low risk/low growth strategy is adopted, risking the company to enter a comfort zone of contractual product development as preferred business activity over in-house NPD.

Consultancy can contribute to the core activity of NPD; increased knowledge on airflows due to consultancy projects that can be adopted in BLS development. Find new opportunities and learn from markets and what Actiflow can contribute (broad perspective on products as long as they are related to airflows).

When Actiflow decided to employ consultancy activities, the first years 100% of revenues was generated through consultancy, in 2008 this was 75% and it is expected to contribute 60-70% to total revenues this year.

External parties Actiflow deals with are YES!Delft, TUDelft and a private investor. The investor has a positive attitude towards consultancy and advised Actiflow to engage in consultancy when the opportunity arose. The investor made them aware of positive side effects after the first consultancy projects. YES!Delft is in principle against shifting focus from NPD, but has seen it as a good way to generate revenues when waiting for product launch. Furthermore, in relation to the economic downturn in automotive industry YES!Delft identified the broad focus and consultancy projects of Actiflow as a good strategy to widen the scope of business activities and survive. In case of a full focus on the automotive industry the chances of survival during the economic downturn would have been lower.

## Case study report: DelftDynamics

DelftDynamics has been established in 2004 to bring a control system for unmanned helicopters to the market. The control system's objective is to enable easy operation of small unmanned helicopters for professional use. The hardware and software are developed by DelftDynamics. The black box in which the control system is delivered was supposed to complement existing unmanned helicopter systems. After developing the control system DelftDynamics realized that the quality of other components that make up the helicopter system was insufficient for professional use. Therefore, further technological development resulted in a complete package including ground station and helicopter. The sector in which DelftDynamics is active is security (private, civil and military). The strategic objective of the company is to offer fit solutions for customers and not only to develop a helicopter system and sell it on a large scale.

According to the initial plan DelftDynamics would market a black box containing a control system. The product focus shifted to development of a complete unmanned helicopter system. Furthermore, the first prototype is used to make data collection flights for customers and as pilot for potential customers to provide insight in the possibilities of using an unmanned helicopter. These are service related business activities that were started after the first prototype was developed and the first complete system was being finished. Another business activity employed by DelftDynamics is consultancy for customers in the field of unmanned aerial vehicles.

Projects that start as a consultancy project can evolve into developing a product to satisfy customer needs. Through these lines consultancy complements NPD. An example is a request of the Dutch Aerospace Institute (NLR) to assist in development of software for simulations which has resulted in the development of hardware and software for a control system similar to the initial 'black box' developed by DelftDynamics.

In 2001 research on control systems and simulation at the faculty of Aerospace engineering led to the idea to commercialize the specific knowledge in this field. In 2004 the opportunity arose to commercialize the knowledge on control systems and simulations and a company was established with a broad focus on products and services. During the pre-organization phase the product idea was further developed, first into a control system to enable simple operation of unmanned helicopters and later into a complete unmanned helicopter package. The threshold of credibility is recently taken by delivering the first complete system to the National Police Forces (KLPD) and a large research project for a Dutch ministry (Rijkswaterstaat). Currently the company considers how to further penetrate the security sector, which new sectors to enter and how to subcontract non-core activities such as image editing. These strategic considerations indicate that the company finds itself in the re-orientation phase.

The development of the system for KLPD was delayed by 1 year. To finance this period the company started to offer consultancy services. Besides a means to solve cash flow problems, consultancy was perceived as a way to improve the knowledge on technological requirements of customers. The possibility to offer services within the field of expertise of DelftDynamics had been considered in advance. Their filing issue in the chamber of commerce describes a company that develops a product but not excludes service activities. Therefore, the company was prepared to engage in consultancy activities and had a strategy to combine NPD activities with consultancy activities.

The cash flow that is generated through engaging in consultancy activities is the main contribution of the strategic change. Furthermore, the knowledge on technical requirements of customers has increased due to consultancy activities. An example is the project for Rijkswaterstaat which resulted in the insight into customer requirements that are hard to quantify without testing such as tolerated vibrations of images and image zooming possibilities from high altitudes.

An underestimated consequence was the impact on the expansion of the network. This is the result of the increased interaction with other parties besides the primary lead user of the product developed by DelftDynamics.

An unexpected consequence is establishing a track record through consultancy projects; with only one sold package a company lacks a track record, this is compensated by consultancy projects that can be added to the track record. Another unexpected consequence was the evolution of a consultancy project into actual product development for a customer.

For the long term DelftDynamics aims to employ NPD activities and service activities. In the future one of the services to be further employed is to collect data requiring helicopters on a contractual basis.

The company runs the risk to spend too much time on a consultancy project when the boundaries of the project are not well defined on beforehand; therefore consultancy projects can require more time than planned for. By exceeding planning the focus is distracted from product development resulting in further delays of product development.

Losing focus of sector is avoided by not accepting projects in marine and automotive sectors. However, widening the scope of technologies within the aviation scope is a present risk.

The effect on core competencies can be observed in two ways: 1) consultancy projects may lead to new product development; 2) consultancy projects may further delay new product development when boundaries are not defined well.

Objective measure on performance shows that 90% of revenues now are the result of consultancy activities and 10% from product sales. A 50/50 distribution of consultancy and product sales is aimed for in the near future.

A clear subjective performance measure is the growth of product portfolio through consultancy projects.

The external parties involved in the development of DelftDynamics are YES!Delft, Rabobank and Syntens. These external partners initially did not stimulate employing multiple activities, but rather motivated the company to focus on NPD. During development of the company the partners realized that cash flow was required to survive and that pilot projects had a positive effect on marketing and technology development. This indicates that the opinion changed along the course of time from negative attitude towards consultancy to acceptance of consultancy.

## Case study report: Intespring

Intespring has been established in 2006 with the aim to develop a product with a lifting mechanism based on springs as its core technology which was developed within TU Delft. The main sector in which the company operates is in-house architecture. The objective is to introduce their lifting system to a variety of markets and establish the technology as the standard in these markets. Currently the company finished development of one product, the balance box, in cooperation with a licensing partner.

Initially the core activity according to the business plan was to commercialize the lifting system through in-house applications. The core activities changed during the development of the company. Besides the development of the balance box, the company offers product design services and technology & ergonomic consultancy services. The services are offered for a wide range of product groups and markets.

Consultancy complements NPD efforts through increasing the knowledge on supplier networks and as a channel to bring developed technology under the attention of potential customers.

The company is established in 2006. The period before start-up and during the early start-up period the company found itself in the research phase. The opportunity framing phase consisted of developing a product and market to commercialize the research result through. During the pre-organization the strategy that balances financing means and risk distribution is developed. During each phase the feedback with previous activities is present. E.g. during the pre-organization phase the licensing partner required Intespring to further develop an electrical control system for the lifting mechanism.

The motivation of Intespring to engage in consultancy is the need to increase cash flow to support fixed costs and await market introduction of the product which is near to completion. The company did not plan the strategic change far in advance. When cash flow appeared to be too low a new strategy was adopted that did not just focus on product development. Therefore, engaging in consultancy is rather a solution for a sudden need of cash flow.

The predicted consequence is mainly the increasing cash flow.

Besides the increase in cash flow Intespring noticed several unpredicted consequences. Firstly, credibility has been increased through establishing a track record of consultancy jobs. Second, through getting in touch with suppliers and other actors in the value chain learning opportunities in new technological fields are apparent that may lead to new ideas for applications of lifting with springs. Another important result is the improved knowledge of market needs and the recognition of opportunities for implementation of the lifting system in new markets.

The primary result in cash flow is noticeable on the short term. The other results cannot be evaluated on the short term. For the longer term Intespring believes consultancy to be a means to cover fixed costs and become a 'light' company. Furthermore, it should contribute to identifying markets and sectors for future products. However, the MT does not intend to continue their consultancy activities when revenues of the balance box are substantial. This may indicate that the contribution to the business development of secondary consequences is not regarded significant.



Intespring identified IP conflicts as one of the risks of engaging in consultancy. It is not always clear whether the results of research are owned by Intespring or the client. The risk of entering a comfort zone by engaging in consultancy may lead to the core activity, NPD, becoming a side activity or a hobby. This risk is not immediately identified by the MT. However, during discussion it was acknowledged.

Due to the lack of a strategic plan in which this scenario was adopted Intespring underestimated aspects of being in a market pull environment rather than a technology push environment. This has resulted in planning problems and problems to establish a network of contacts.

The effect on the core activities is characterized by the role of consultancy complementing NPD. Furthermore, it plays an important role to enable survival of the business when NPD does not create revenues. In this case the risk of entering a comfort zone is increased.

The influence on objective performance measure is measured by the share of total revenues earned through consultancy. Currently this is 100%.

The influence on subjective performance measures cannot be specified yet. But in the future it should lead to new technological and market knowledge that result in new products being marketed.

The licensing partner prefers to regard Intespring as a consultancy company. Since most financial risk is taken by the licensing partner contractual product development based on consultancy projects is more attractive than joint development efforts with a license agreement. Some tension is created by conflicting interests in risk distribution, financing research and IP rights.

The incubator regards consultancy as deviating from the core activity on the one hand, but on the other hand it recognizes the need to bridge cash constraint periods.

The relations with external parties are not noticeably affected by the strategic change. It has not lead to additional external funding.

## Case study report: Quintech

Quintech was established in 2006 as a result of thesis projects related to luggage handling at Schiphol. Quintech started with a concept to enable automatic loading and unloading of luggage. The system uses luggage scanning, pattern recognition and optimization of container stacking.

The initial strategy was to develop a complete luggage handling system of which the operating software and specific technologies were developed in-house and complemented by off-the-shelf products.

According to the initial business plan the core activities were software development and development of luggage scanning, pattern recognition and a luggage container. Since start-up the core activities drastically changed due to cancellation of a large investment these plans could not be realized. This led to a stop of NPD and in order to survive the company engaged in very diverse consultancy projects to survive and generate cash flow before new investors could be attracted. An example of such diverse projects is writing the business strategy of a mobile phone services company. The new business objective is to evolve into sustainable consultancy company for airport operations and to continue NPD.

The large system is divided into smaller modules of which the luggage scanner is now being developed in cooperation with a large industry partner that finances NPD.

Consultancy activities do not complement NPD efforts. Consultancy has not led to marketing opportunities for the products being developed.

The company has gone through a rapid succession of the first three phases. In the pre-organization phase the major investment was cancelled. This required the company to instantly re-orientate and find a new opportunity to survive, since the scenario of a cancelled investment was not considered. Besides generating cash flow research was conducted on dividing the luggage handling system in components that could be marketed with new partners.

Therefore, the company is currently in the feedback loop within the re-orientation phase.

The motivation to change the focus from NPD to consultancy activities was to generate instant cash flow in order to survive. The possibility to shift focus from NPD to service oriented business activities was not considered in advance. It was rather an instantaneous solution for the need to survive after an investment had been cancelled and the NPD activities had to be stopped. The first projects were diverse and along the course of time Quintech managed to refocus on airport handling.

The predicted result of the strategic change was the survival of the company by offering consultancy services to customers.

During the first six months the company managed to generate sufficient cash flow to survive. Secondary results of consultancy appeared after the first 6 months of offering consultancy when the company focused more on consultancy within airport handling. The identified secondary consequences are creating a network that leads to new assignments, establishing credibility and knowledge of the market and its products that lead to opportunity recognition.

Besides the positive consequences of engaging in consultancy the company has to cope with the risks and negative consequences as well. The company risks its credibility of being a consultancy company when it offers solutions to customers that imply installing a system developed by the NPD

group of the company. The credibility of being an independent consultancy company is jeopardized. On the other hand, by focusing on consultancy services the company may risk its reputation as being primarily a NPD oriented company. Engaging in consultancy in this case may be at the expense of credibility for NPD efforts.

Another negative consequence due to the shift of focus from NPD to consultancy services is that half of the workforce is now focusing on consultancy instead of attracting investments to finance NPD and therefore, the time to market is drastically increasing and development is slowed down. Dividing the workforce in a consultancy and product development group has two more consequences. First, competition between the two groups hampers information sharing and creates a negative atmosphere since the consultancy group feels they earn the money that is spent by the product development group. Second, since the consultancy group can fully support the whole company, it would be more profitable to completely shift the focus to consultancy and be a profitable company without high growth perspectives but with continuity. This might postpone the NPD efforts indefinitely.

Although Quintech aspires high growth through developing and marketing scalable products consultancy will remain an important business activity to guarantee continuity of the company.

Currently 95% of the revenue is generated through consultancy. If the development of the luggage scanner is finished the revenue should be 40% consultancy and 60% product sales.

The external parties that are involved in development of the company are the incubator, the university and an industry partner.

The incubator has explicitly warned the company not to lose the focus on NPD since the risk of turning into a consultancy company is high. Along the course of time their opinion has been less fierce but they still convey the message that consultancy does not lead to sufficient financing for NPD and that other financing means should be looked for.

The connections within the university have no interest in the company through IP rights and have therefore less influence on strategic decisions. However, the university benefits from teaching services offered by the consultancy group at the faculty of Aerospace engineering.

In retrospect the company has adopted a low risk strategy with low growth potential by focusing on consultancy activities in an early development phase. This has lead to the delayed market introduction of a product developed by Quintech.

### **Appendix III: Case study database**

This appendix includes a CD with all case study data.