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Master Thesis

Analysis of Technology-Based Ventures –  
Harmonized Instrument Initiative: Analyzing  
University Spin-Offs and Their Development Process

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## ABSTRACT

Currently there is no broader approach to the analysis of technology-based ventures from German universities. Therefore, this work is dealing with the Harmonized Instrument Initiative (HII), a joint project of the three German technical universities Karlsruhe Institute of Technology (KIT), Technische Universität Berlin and Technische Universität München to develop a standardized instrument (ten-minute questionnaire) for tracking the development process of technology-based ventures, especially academic spin-offs. The HII thus aims to allow transparency and comparability across the start-up ecosystems of German universities and lays the foundation for further research in the field of academic entrepreneurship. This work is the detailed description of the research design, the questionnaire, its implementation and related issues. It gives the necessary theoretical background, introduces the 45 questions of the questionnaire and shows starting points for additional research.

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## List of Abbreviations

- CVC – Corporate Venture Capitalist
- EIP – Entrepreneurship Indicators Programme
- HII – Harmonized Instrument Initiative
- IP – Intellectual Property
- KIT – Karlsruhe Institute of Technology
- OECD – Organization for Economic Cooperation and Development
- R&D – Research and Development
- TTO – Technology Transfer Office
- TUB – Technische Universität Berlin
- TUM – Technische Universität München
- USP – Unique Selling Proposition

## 1. Introduction

This work is written in connection with the Harmonized Instrument Initiative (HII), a joint project of the three German technical universities Karlsruhe Institute of Technology (KIT), Technische Universität Berlin (TUB) and Technische Universität München (TUM) to develop a standardized instrument (ten-minute questionnaire) for tracking the development process of technology-based ventures, especially academic spin-offs.

Although “it is suggested that university innovations stimulate economies by spurring product development, by creating new industries, and by contributing to employment and wealth creation” (O’Shea *et al.* 2007, p. 653) there is currently no common method for tracking foundation activities in the surrounding of German universities. There is a lot of effort in supporting technology-based ventures – like the EXIST program – but research in this field has not been done to a greater extent. Neither public promotion of ventures is coordinated nor do many universities have an overview of their foundation activities or potentials.

Furthermore, most studies in the field of entrepreneurship are cross-sectional in design, while longitudinal studies investigating the development process have not been applied to a bigger set of ventures so far (Helm & Mauroner 2007, p. 263).

To overcome this shortcoming, the HII was started. The questionnaire developed within this joint project allows transparency and comparability across the start-up ecosystems and lays the foundation for further research in the field of academic entrepreneurship. With the longitudinal design and the survey being repeated every two years, the development of a large set of different companies can be tracked and analyzed.

The questionnaire is designed to require a time effort of about ten minutes. It is derived from an extensive literature research and analysis of best practices in the field of empirical entrepreneurship research and especially academic entrepreneurship and consists of 45 questions, structured in seven areas of

interest: Contact Information, General Information, Connections to University, Finance, Founding Team, Business Concept and Technology, and Market and Competition. These questions are classified as continuous and as one-time questions. One-time questions are questions about the founding team or the opportunity recognition process for example. Here it is sufficient to answer the question once, since the answer is not subject to change over time. Questions about, for example, current financial issues and the present competitive situation on the contrary are continuous questions where the answers are likely to change in course of time. These questions will be employed in subsequent surveys as well in order to track the venture's development process.

After giving the theoretical background of cross-sectional and longitudinal research and of entrepreneurship, academic entrepreneurship and venture development processes in Chapter 2, the questionnaire is introduced in Chapter 3 where each of the 45 questions is embedded into its theoretical and/or empirical background. This chapter then ends with information on the pretests and the implementation of the questionnaire. Chapter 4 deals with the questions that could not have been included within the questionnaire due to its limited length and hence gives a good overview of starting points for further research. Chapter 5 then is about the possibilities of the HII and further research and the final Chapter 6 summarizes this work and gives a brief outlook.

## 2. Background

Prior to formulating the questions of the desired questionnaire, one has to get familiar with the necessary background. Therefore Chapter 2 introduces the fundamentals of cross-sectional and longitudinal research and the entrepreneurial background and then presents a political initiative of the OECD, which developed a framework to enhance harmonized data collection on entrepreneurship in different countries.

### 2.1 Fundamentals of Cross-Sectional and Longitudinal Research

Although there is enough to write a whole thesis about research methods and designs, the following part gives only a brief overview of the essence of quantitative, cross-sectional and longitudinal research and the fundamentals of questionnaires. Therefore, quantitative, cross-sectional and longitudinal research will be embedded in the general research methods and designs and the terms cross-sectional and longitudinal research will be defined. Afterwards the term questionnaire will be defined and some basic guidelines for the creation of questionnaires will be stated. Finally, the essential criteria reliability and validity will be introduced.

#### 2.1.1 Quantitative Research

When doing research one has to create a link between research and theory. This link may be either deductive or inductive theory.<sup>1</sup> While deductive theory sees theory preceding the actual research activity and hence proves hypothesis by testing, inductive theory derives theory from observations in research. Inductive theory is mainly employed when theoretical hypothesis cannot be drawn from existing research and new theories have to be generated (Bryman & Bell 2003, pp. 9).

Another useful differentiation concerns epistemological considerations: “the question of what is (or should be) regarded as acceptable knowledge in a

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<sup>1</sup> These two categories are actually not absolutely clear-cut and in practice an iterative approach is employed very frequently (Bryman & Bell 2003, pp. 12).

discipline” (Bryman & Bell 2003, p. 13). The two possible directions here are positivism which defends the appliance of the methods of natural science in social studies, and interpretivism which calls for an own strategy that analysis social issues with regard to the differences between individuals and the objects of natural science (ibid, pp. 14).

A third possibility to distinguish between research methods involves ontological considerations: “the question of whether social entities can and should be considered objective entities that have a reality external to social actors, or whether they can and should be considered social constructs build up from the perceptions and actions of social actors” (Bryman & Bell 2003, p. 19). While objectivism asserts social phenomena and their meanings to exist independent of social actors, constructionism assumes them to be continually accomplished by social actors (ibid, pp. 19).

Along these three criteria, a higher-level classification in practical research is the distinction between quantitative and qualitative research strategies. An often used, but by far not sufficient differentiation is “the fact that quantitative researchers employ measurement and qualitative researchers do not” (Bryman & Bell 2003, p. 25). Going beyond the surface, quantitative research can generally be characterized as deductive, employing positivism and objectivism and qualitative research, on the other hand, as inductive, employing interpretivism and constructionism (ibid).

Since in the area of entrepreneurship a lot of research has been undertaken we will employ deductive theory, i.e. we will derive the research questions from existing theories and hence identify the data of interest to be collected.

Furthermore we are more likely to use the methods from natural science, especially multivariate analysis for dealing with the collected data and see the data mainly as independent of social actors. Hence we are in the field of quantitative research.

### 2.1.2 Cross-Sectional and Longitudinal Research

After having determined the research strategy being employed we will now have a closer look on the research design, i.e. the framework for collecting and analyzing of data. Bryman & Bell (2003) name five prominent research designs (p. 32): Experimental and related designs, cross-sectional design, longitudinal design, case study design and comparative design. Without going into more detail with the other designs, the cross-sectional and the longitudinal research design will be outlined shortly.

Cross-sectional research has mainly four characteristics (Bryman & Bell 2003, pp. 48):

- Data on more than one case is collected, since this design is interested in variation of the collected data.
- Data collection happens more or less at one single point in time and the data are collected simultaneously.
- The collected data are quantitative or quantifiable to facilitate the examination of the variation within the set of collected data.
- The results of a cross-sectional data only denote patterns of association, since a causal relationship cannot be drawn from a simultaneous data collection.

Hence it is defined as follows:

“A cross-sectional design entails the collection of data on more than one case (usually quite a lot more than one) and at a single point in time in order to collect a body of quantitative or quantifiable data in connection with two or more variables (usually many more than two), which are then examined to detect patterns of association” (Bryman & Bell 2003, p. 48).

The data collected through a cross-sectional research design are of the form of a matrix like illustrated in Figure 1. For any of the  $m$  objects (case) every of the  $n$  variables (observation, obs) has a value  $x_{ij}$ . These data may then be examined for correlations between variables, for example through multivariate analysis.

The longitudinal research design is usually used to track changes in the research of business and management (Bryman & Bell 2003, pp. 51). Its goal is to provide data on the circumstances through which changes are caused (Pettigrew 1990, p. 269). However, due to the time and cost related with longitudinal design it is relatively rare in business and management research. Very often it is an extension of cross-sectional research where the data are collected by self-completion questionnaires or structured interviews and hence has many characteristics in common with the research design introduced previously (Bryman & Bell 2003, p. 52).

	Obs <sub>1</sub>	Obs <sub>2</sub>	Obs <sub>3</sub>	...	Obs <sub>n</sub>		T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	...	T <sub>n</sub>
Case <sub>1</sub>	x <sub>11</sub>	x <sub>12</sub>	x <sub>13</sub>		x <sub>1n</sub>	Obs <sub>1</sub>	Obs <sub>1</sub>	Obs <sub>1</sub>			Obs <sub>1</sub>
Case <sub>2</sub>	x <sub>21</sub>	x <sub>22</sub>	x <sub>23</sub>		x <sub>2n</sub>	Obs <sub>2</sub>	Obs <sub>2</sub>	Obs <sub>2</sub>			Obs <sub>2</sub>
Case <sub>3</sub>	x <sub>31</sub>	x <sub>32</sub>	x <sub>33</sub>		x <sub>3n</sub>	Obs <sub>3</sub>	Obs <sub>3</sub>	Obs <sub>3</sub>			Obs <sub>3</sub>
...						...	...	...			...
Case <sub>m</sub>	x <sub>m1</sub>	x <sub>m2</sub>	x <sub>m3</sub>		x <sub>mn</sub>	Obs <sub>n</sub>	Obs <sub>n</sub>	Obs <sub>n</sub>			Obs <sub>n</sub>
Cross-Sectional Design						Longitudinal Design					

Figure 1: Research Design (Bryman & Bell 2003, fig. 2.3, fig. 2.4)

Longitudinal research is defined as follows:

“Longitudinal organizational research consists of those techniques, methodologies and activities which permit the observation, description and/or classification of organizational phenomena in such a way that process can be identified and empirically documented.” (Kimberly 1976, pp. 329)

In a longitudinal study data are collected in at least two different points of time (see Figure 1). The main advantage of longitudinal over cross-sectional design is that it allows some insight into the time order of variables and hence rather enables to make causal inferences. Although it does not solve the entire issue about the ambiguity of causal influence, at least it gives information about which variable came first (Bryman & Bell 2003, p. 53). Miller & Friesen (1982) argue: “It is very hard to draw inferences about the operations of machines by looking at

snapshots of a diverse array of them. It is much more instructive to watch a few machines in motion, seeing how their parts interact while examining their inputs and outputs.” (pp. 1014)

### 2.1.3 Questionnaires

Very common instruments employed in cross-sectional research are questionnaires and structured interviewing. Since a structured interview “is in many, if not most respects a questionnaire that is administered by an interviewer” (Bryman & Bell 2003, p. 141) and a questionnaire facilitates cheaper data collection with larger samples (Bryman & Bell 2003, p. 142; Leedy & Ormrod 2010, p. 189), we will focus on so called self-completion questionnaires, i.e. respondents answer the questions themselves. Although the creation of a good questionnaire is a science in itself, only a short definition is given here as follows (translated from Porst 1998, p.21):

A questionnaire is a more or less standardized set of questions that is submitted to people for answering with the aim to use their answers for review of the underlying theoretical concepts and relationships. The questionnaire is the connection between theory and analysis.

Porst (2011) mentions a lot of issues that have to be considered. From an attractive first page to motivate the respondents through clear remarks for completion, the right wording, the appropriate use of scales, and up to the right arrangement of the questions many aspects influence the quality of answers and especially the response rate.

The first page should contain several necessary information, like a short and clear title to inform the respondent about the general aim of the study, the address of the institution undertaking the research and a contact for possible questions. Furthermore, a suitable cover-picture may serve as an eye-catcher and motivates respondents (Porst 2011, pp. 34).

Clear remarks for completion of the questionnaire support two aims. On the one hand, the results gained from a survey depend on the respondents understanding the way to answer the different questions; on the other hand, if people do not

understand how to fill out the questionnaire, they are much more likely not to finish the questionnaire. Hence it is very important that the instructions for completion are stated clearly, for example, on page two and cover all existing types of questions in the questionnaire (Porst 2011, pp. 45).

Adequate wording of the questions is absolutely elementary for gaining the right answers. Porst (2011) gives ten rules for wording (pp. 95):

- Use simple and unambiguous terms all respondents understand in the same manner.
- Avoid long and complex questions.
- Avoid hypothetical questions.
- Avoid duplicative stimuli or negations.
- Avoid insinuations or suggestive questions.
- Avoid questions which demand information many respondents may not possess.
- Use questions with clear limits of time.
- Use exhaustive and disjunctive answer options.
- Assure that the context of a question does not (uncontrolledly) affect their reply.
- Avoid unclear terms.

Leedy & Ormrod (2010) give some additional guidelines besides wording (pp. 194):

- Keep it short.
- Keep the respondent's tasks simple.
- Provide clear instructions.
- Give a rationale for any items whose purpose may be unclear.
- Determine in advance how you will code the responses.
- Check for consistency.
- Conduct one or more pilot tests to determine the validity of your questionnaire.

- Scrutinize the almost-final product one more time to make sure it addresses your needs.
- Make the questionnaire attractive and professional looking.

To *measure* the answers of the respondents you may use scales for some questions. There are mainly four different types of scales. Nominal scales are used, if a respondent can decide clearly, if answer A or B is right, for example “male” or “female”. Ordinal scales make use of a ranking of the different answer options, like “good”, “better” or “best”. Interval scales are basically ordinal scales but with the additional characteristic, that the different options are equidistant, which means, that the difference between options A and B is the same as the difference between options C and D. And finally ratio scales have a real zero value and are used for example for questions about physical measures like the number of children one has. Deriving from this basic set of scales, social surveys make use of verbalized scales or scales where only the end points are denominated and even or odd scales where the number of options is even or odd, i.e. scales which do or do not have a midpoint. Furthermore, considerations of the optimal scale width, the direction of scales or the dimensionality are of interest (Porst 2011, pp. 69).

Regarding the arrangement of the questionnaire, a logical order should be deployed to support concentration and motivation of the respondents. The questions should be subsumed to denominated thematic blocks and standard questions like demographic questions should be asked at the end, because people motivated through the title of a questionnaire should not be asked simple, seemingly uninteresting questions at the very beginning. On the other hand, a person who got through the entire questionnaire so far is not very likely to abort at the last, simple questions (Porst 2011, pp. 142).

To enhance the response rate Bryman & Bell (2003) give ten practical advices (pp. 144):

- Write a good covering letter which states the importance of the study.
- Accompany postal questionnaires by a stamped addressed envelope.

- Follow up respondents who did not answer with two or even three mailings.
- Shorter questionnaires tend to gain higher response rates.
- Employ clear instructions and an eye-catching layout.
- Avoid an unnecessary bulky appearance of the questionnaire.
- Start with questions which are of interest to the respondents.
- Personalize the cover letter.
- Use as few open questions as possible.
- Provide small monetary incentives if possible.

Even though a lot of the named advices seem to be obvious, it is important to face these facets when dealing with the definite formulation of the questions in Chapter 3.

#### 2.1.4 Criteria: Reliability and Validity

When doing research one has to consider two main criteria: Reliability and validity.

Reliability generally means the repeatability of research findings, i.e. if measures are consistent. Reliable measures therefore should lead to the same results when the same thing is measured a second time (Bryman & Bell 2003, p. 33).

Validity on the other hand is considered to be the more important criterion and is concerned with the integrity of conclusions drawn from research. One distinguishes between measurement validity, internal validity, external validity and ecological validity. Measurement validity deals with the question of whether a measure really measures the concept it is supposed to do. For example, does an IQ test really assess variations in intelligence? Internal validity concerns the assumed causality, which means, if y really depends on x and not on something else. External validity deals with the generalization of research findings beyond the specific context, and hence is directly related with the generation of representative samples for example. Ecological validity is concerned with the problem of unnatural conditions of research. Data or respectively answers may be

influenced by an uncommon surrounding like a laboratory or by the uncommon situation of completing a questionnaire (Bryman & Bell 2003, pp. 33).

While reliability and measurement validity depend more on the quality of the employed measures than on the nature of the research design, the other issues can be evaluated for cross-sectional and longitudinal research. Internal validity is usually weak, since it is very difficult to deduce causal directions from the collected data. Strong external validity can be achieved through random sample selection for example. Ecological validity cannot be guaranteed, because cross-sectional and longitudinal research use research instruments like self-completion questionnaires which disrupt a natural situation (Bryman & Bell 2003, pp. 49).

## 2.2 Entrepreneurial Background

Before one can start with the analysis of entrepreneurial characteristics and processes, one has to deal with the fundamentals of entrepreneurship first. Therefore, within this chapter the terms *entrepreneurship* and *technology-based venture* will be declared and defined, an introduction to academic entrepreneurship will be given, the main fields of challenges a venture has to face will be identified, and the different stages of the venture lifecycle will be examined.

### 2.2.1 Definitions: Entrepreneurship and Technology-Based Ventures

When talking about ventures, one has to talk about entrepreneurship first. According to the French economist J. B. Say in 1800, the entrepreneur “shifts economic resources out of an area of lower and into an area of higher productivity and greater yield” (Drucker 2011, p. 19). With absolutely diverse personalities and temperaments performing well in entrepreneurial challenges, according to Drucker (2011), entrepreneurship “is behavior rather than personality trait” (p. 23). The most important requirements to be successful in entrepreneurship are the abilities to handle uncertainty and to face up to decision making (ibid).

As one can see, it is hard to describe the term entrepreneur or entrepreneurship exactly in a few words. This is why there is no unique definition of the term entrepreneurship in literature (Volkman & Tokarski 2007, p. 2). “Many

researchers have defined an entrepreneur by providing a description so broad that it allows the readers to make their own conclusions“ (Sexton *et al.* 1997, p.2). The different definitions of entrepreneurship do mainly have four attributes in common: the identification and use of an entrepreneurial opportunity, innovation and novelty, exploitation of resources and foundation of a company or an organization and profit orientation in consideration of adequate risks and uncertainties (Dollinger 2003, cited by Volkmann & Tokarski 2007, pp. 5).

The Organization for Economic Cooperation and Development (OECD), for example, defines entrepreneurs and entrepreneurial activity as follows (Ahmad & Hoffman 2008, p. 4):

“Entrepreneurs are those persons (business owners) who seek to generate value through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets.”

“Entrepreneurial activity is the enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets”.

These definitions from the OECD see entrepreneurship not only in the formation of new businesses but also in the expansion of an existing firm. While this may be appropriate for the policy perspective of the OECD, we will only have a look at the creation of new companies deriving from entrepreneurial activities. The following short definition best describes the essence of these new companies we will refer to as ventures, spin-offs or start-ups in the remaining work:

“A startup is a human institution designed to create a new product or service under conditions of extreme uncertainty.” (Ries 2011, p. 27)

All new businesses have a lot of similarities. But entrepreneurial companies have special characteristics besides being small and new. They are a minority among new firms (Drucker 2011, p. 20).

There are three types of new firms: “Salary-substitute firms are small firms that yield a level of income for their owner or owners similar to what they would earn

when working for an employer. [...] Lifestyle firms provide their owner or owners the opportunity to pursue a particular lifestyle and earn a living while doing so. [...] Entrepreneurial firms bring new products and services to market” (Barringer & Ireland 2012, p. 44). In this work, we always refer to entrepreneurial firms when talking about start-ups, spin-offs or ventures.

The term technology-based venture is defined according to the definition of “innovatives Technologieunternehmen” (innovative technology company) of the German *Kreditanstalt für Wiederaufbau* (KfW). Thus a technology-based venture is not older than ten years and fulfills four criteria (KfW Bankengruppe 2011, p. 2):

- It develops new or significantly improved products, processes and services or introduces them to the market,
- The parts of the development activities considering the innovative core are provided in the company itself. If foreign services are used for development activities the specifications have to be developed within the company itself,
- New products (processes/ services) developed by the company differ in their essential features from existing products (processes/ services) of the company and base on research and development activities,
- The market opportunities for the companies indicate an above-average sales and/ or employment growth.

Hence again we focus on entrepreneurial firms and are not interested in the other kinds of start-ups which are not based on technological innovations.

### 2.2.2 Academic Entrepreneurship

One possibility to define academic entrepreneurship is the approach of Acatech (2010), which sees a venture as university spin-off if at least two of the following three criteria are fulfilled:

- The commercialization is based on a technology developed within the research institution (Smilor *et al.* 1990, p. 64; Steffensen *et al.* 2000, pp. 96);

- The venture is founded by at least one member of the research institution (Agarwal *et al.* 2004, p. 502; Steffensen *et al.* 2000, pp. 96);
- The venture is legally independent, but the parent organization holds an equity stake (Wright *et al.* 2006, pp. 481).

Even though this definition gives a good idea of what academic entrepreneurship involves, we will stick to the definition of three different types of firms deriving from universities and university members. According to Egelin *et al.* (2002) we employ the distinction between exploitation spin-offs, competence spin-offs and academic start-ups.

Exploitation spin-off:

“A particular type of spin-off company that is created for the purpose of commercially exploiting knowledge, technology, or research results developed within a university.” (Gübeli & Doloreux 2005, p. 270; see also Egelin *et al.* 2002, p. 9; Wright *et al.* 2007, p. 4)

Competence spin-off:

“A new company that is formed [...] by a faculty member, staff member, or student who left university to found the company or started the company while still affiliated with the university.” (Clarysse & Moray 2004, p. 59; see also Egelin *et al.* 2002, p. 9; Hiscocks 2005, p. 4)

Academic start-up:

All new companies founded by people with a university degree excluding spin-offs. (Egelin *et al.* 2002, p. 9)

While some authors mix up the two different types of spin-off companies and for example employ a two-dimensional definition for university spin-offs (like Clarysse & Moray 2004), it seems to be useful to employ two different terms.

The set of competence spin-offs is much larger than the set of exploitation spin-offs, because it includes, for example, all the firms founded by graduates of the university directly after their graduation. Since most universities do not know

about the companies created by their graduates, most studies focus on exploitation spin-offs only (Wright *et al.* 2007, pp. 4). However, this is exactly one of the main goals of the HII: identifying competence spin-offs as well as exploitation spin-offs and keeping track of their development process. Identifying all academic start-ups as well is not practicable without further ado.

Most studies deal only with exploitation spin-offs, since these companies “are the easiest to keep track of for the technology transfer offices (TTO) since they are by definition based upon university IP [Intellectual Property]” (Wright *et al.* 2007, p. 4).

Clarysse *et al.* (2005) identify six types of resources to be key to the spin-off process for exploitation spin-offs: human, social, financial, physical, technology, and organizational resources (p. 188). They state three different types of incubation models for public research institutions regarding the goals and objectives for creating new spin-offs. There is the low-selective model which needs the fewest resources and often consists only of a few people and no organizational structure. It's primarily goal is to create employment by supporting new companies. In the supportive model at least 20 persons are needed to organize the spin-off process in a TTO supported by the IP department and contract research unit. It sees the spin-off as an alternative commercializing technology to licensing out a patent. In the incubator model, finally, financial participation is seen to generate more revenues than future contract research and the main objective is to create financially attractive spin-offs (Clarysse *et al.* 2005, pp. 184; Wright *et al.* 2007, pp. 86).

When dealing with academic entrepreneurship one is often confronted with the so-called European Paradox or European Innovation Paradox. This paradox deals with the phenomenon that the European Union is leading in the output of top-level scientific papers, but is not able to transform this scientific productivity into successful innovations (Franzoni & Lissoni 2006, p. 4; Wright *et al.* 2007, p. 6). This issue illustrates the need of gaining a better understanding of the underlying processes of academic entrepreneurship to close the gap between scientific output and wealth-generating firm creation.

Gübeli & Doloreux (2005) investigate the role of the university in the spin-off process at Linköping University. They state the university to be important mainly during the pre-founding stage. Not only that the business ideas often emerge from projects and research conducted at university, there is also vital support in preparing the commercialization of the product. The university mainly helps with infrastructure and expertise. Regarding the networking activity, Gübeli & Doloreux argue that the focus changes from internal networks, strengths and capabilities in the early stage to external networks and regional and infra-structural support in the post-founding stage. A vital role is also played by municipal and regional support services through the generation of social networks for firms with common interests. They advise the universities to be more active in later stages, for example, as a central network agency to facilitate interaction and firm formation (pp. 279).

Table 1: Specific Characteristics of Exploitation Spin-Offs (Helm & Mauroner 2007, tab. 1)

<b>Founder</b>
Unique history and experience
Specific human capital and former experience
<b>Environment</b>
Parent organization plays a specific role in the foundation of the enterprise and the business process
Spin-offs are usually located close to the parent
<b>Enterprise</b>
High degree of innovation and newness
Low technological maturity
Difficult judgement of the value of an innovative project
Easy recruiting of qualified staff members
Good capabilities and conditions for implementing innovations
Broad experience in Research and Development
<b>Success</b>
Success consists of achievement of technology transfer in addition to entrepreneurial and personal success
Narrow margin between success and failure as a result of the innovation potential

Helm & Mauroner (2007) summarize the special characteristics of research-based spin-offs, i.e. especially exploitation spin-offs defined previously as shown in Table 1.

The success of research-based spin-offs is influenced by three categories of factors: the characteristics of the founding team, the environment of the spin-off and the company itself. The strong influence of the incubator or parental organization is unique to research-based spin-offs (Helm & Mauroner 2007, p. 240). Figure 2 illustrates the different success factors for spin-offs as they are empirical investigated so far.

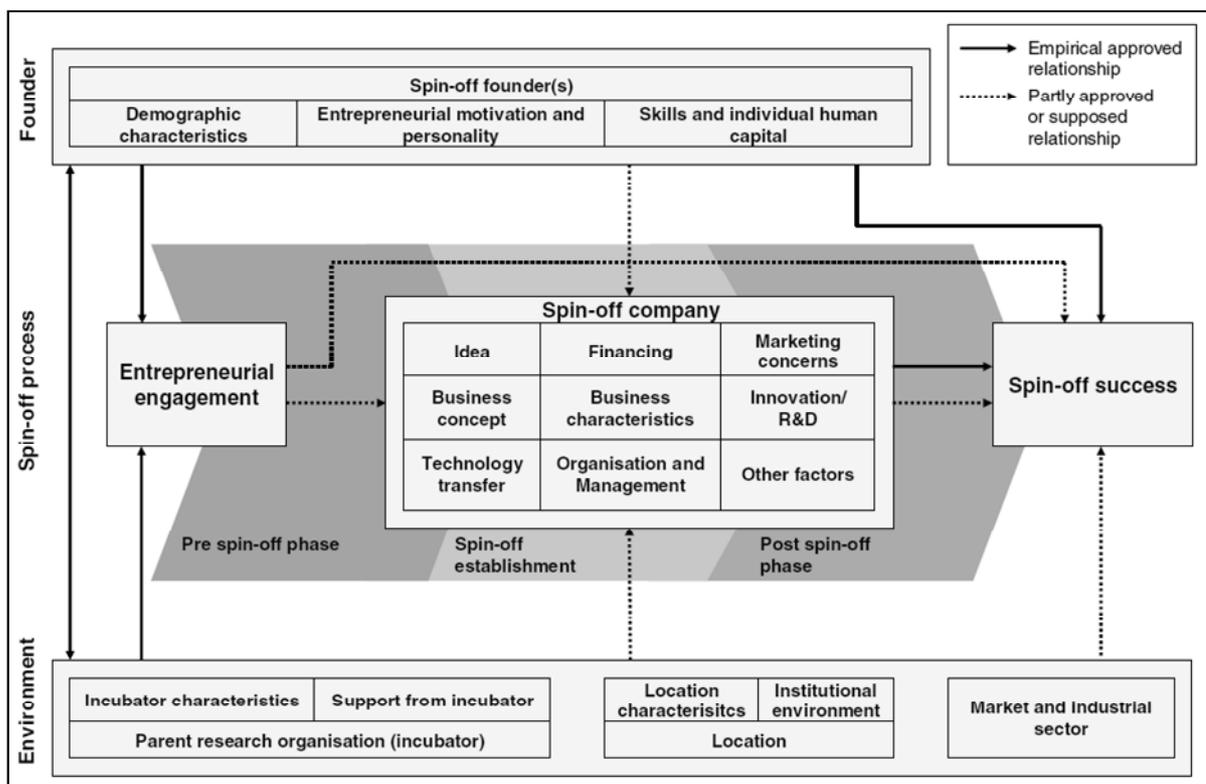


Figure 2: Influence Factors on Research-Based Spin-Off Venturing (Helm & Mauroner 2007, fig. 5)

While empirical results on the success of spin-offs suggest a higher survival rate than other start-ups in the same industrial sector (Helm & Mauroner 2007, p. 246; O’Shea *et al.* 2004, p. 21), the results regarding the growth of spin-offs are controversial (Helm & Mauroner 2007, p. 246).

As already mentioned, the university plays a pivotal role in the spin-off process. The services offered for entrepreneurs differ very widely. Incubators offer support

in various activities such as planning Research and Development (R&D), seeking financial resources for the project, building and tutoring the team, administrative and professional consulting, guidance and supervision, raising capital and setting up for marketing, giving administrative and secretarial services, maintenance, procurements, accounting and legal advice, and giving business and professional guidance. A special service may be offered by a possibly existing TTO. This TTO builds “synergistic networks between academics and venture capitalists, advisors and managers who provide the human and financial resources that are necessary to start a company” and provides “company formation expertise, as many technology transfer personnel have experience in evaluating markets, writing business plans, raising venture capital, assembling venture teams and obtaining space and equipment” (O’Shea *et al.* 2004, p.18).

Egelin *et al.* (2002) did the first larger investigation of university spin-offs and start-ups in Germany. They did not collect their data from research institutions, TTOs or start-up centers, but from the spin-offs and start-ups itself and thus overcome the issue that competence spin-offs and academic start-ups are usually not registered at university (pp. 4). Hence the study of Egelin *et al.* (2002) is a fundamental work for research in this subject.

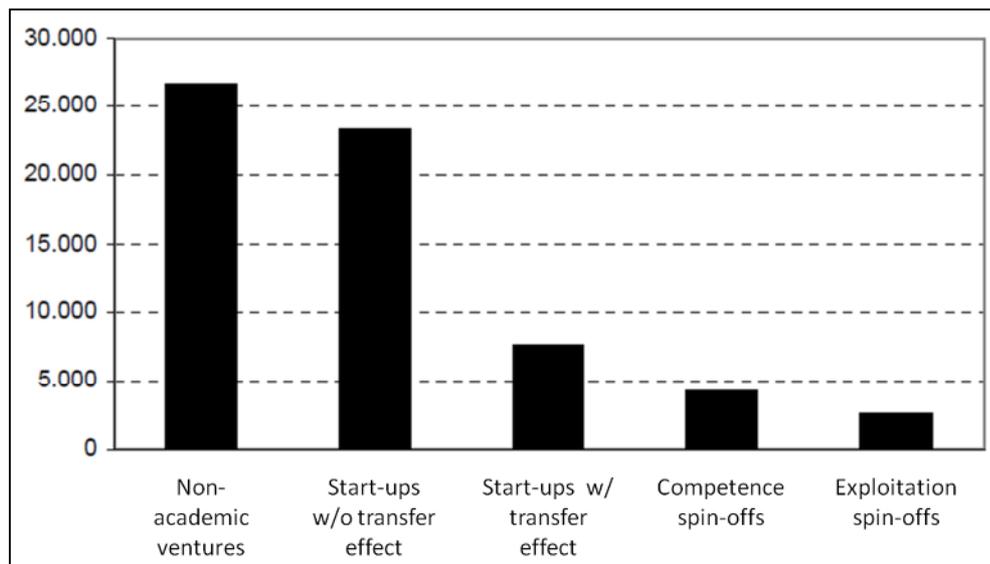


Figure 3: Yearly Foundations in Research- and Knowledge-Intensive Industries in Germany 1996 - 2000 (Egelin *et al.* 2002, fig. 2)

The quantitative results for yearly firm foundation in the second half of the 1990s are illustrated in Figure 3. Exploitation spin-offs make up only 1 % of all foundations and 4 % of the foundations in research- and knowledge-intensive industries. Competence spin-offs account for 2 %, respectively 7 % of the foundations. Academic start-ups make up 12 % of all new firms and 48 % of the new firms within the research- and knowledge-intensive industries. They can be subdivided into two categories: start-ups with (25 %) and without (75 %) technological transfer effect (ibid, pp. 10).

In their extensive literature review to the subject of research-based spin-offs Helm & Mauroner (2007) constitute a lack of longitudinal studies and call for future studies “to explain in detail the long-term success of innovative spin-off companies” (pp. 262).

### 2.2.3 Venture Life Cycle

“Like people and plants, organizations have a life cycle. They have a green and supple youth, a time of flourishing strength, and a gnarled old age” (Gardner 1965 cited by Lippitt & Schmidt 1968, p. 102). Almost fifty years ago, John W. Gardner kind of started the theory of life cycles of organizations. Since then various models for this life cycle have been developed, dealing predominantly with “small, new or rapidly growing firms, particularly in the high technology sector” (Bessant et al. 2005, p. 8). 33 of these models were collected by Bessant et al. (2005) and are appended to this work (see appendix A). For this longitudinal study the theory of organization life cycle is of prime importance and some fundamental models and essential aspects will be introduced within this paragraph.

Life cycle models try to systematically categorize the growth patterns and challenges of emerging firms (Churchill & Lewis 1986, p. 30). Two main assumptions underpin the life cycle theory and its models: organizations develop linearly, within this development they pass through discrete stages (Bessant et al. 2005, p. 8). Although these assumptions have been criticized by different researchers (ibid), the theory of venture life cycle gives a good guideline for

investigating the development of new ventures. One schematic concept of a typical development process is illustrated in Figure 4.

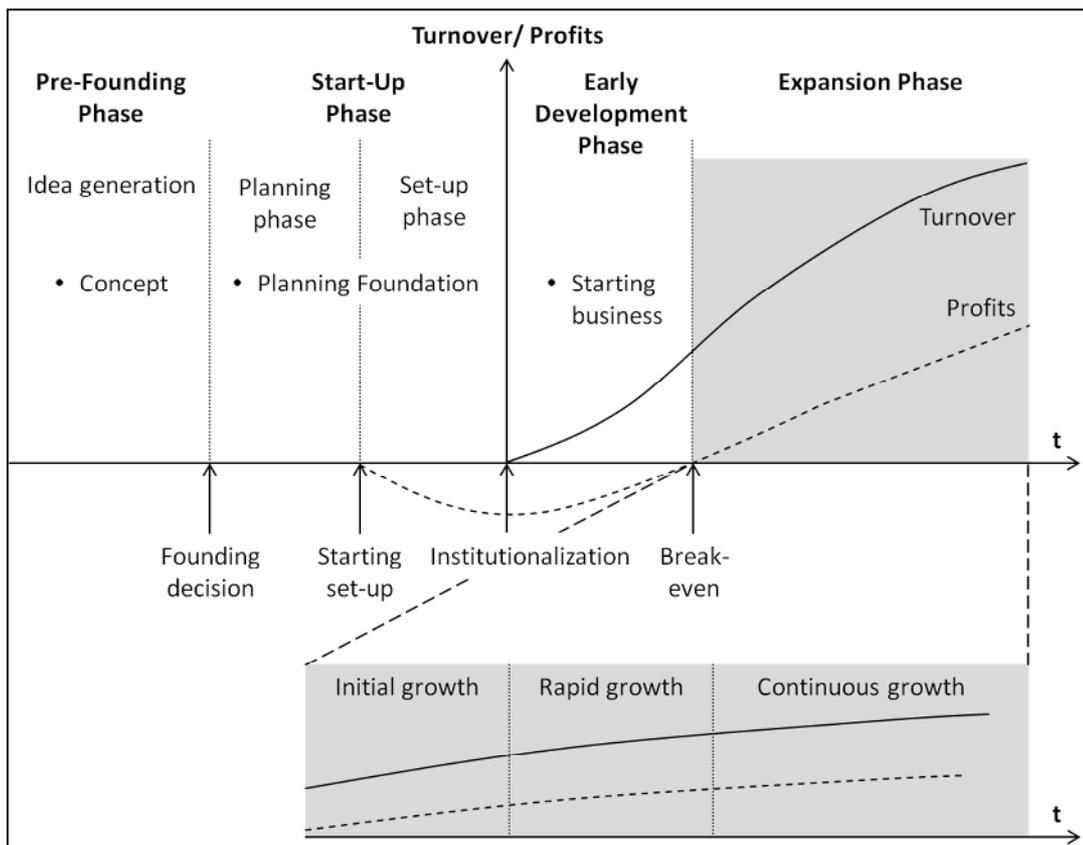


Figure 4: Integrated Life Cycle Concept (Volkman & Tokarski 2007, p. 402)

One main issue when dealing with life cycle models is the definition of the related stages. Stages are defined in multidimensional terms, including dimensions of organization context and organization structure. Contextual variables are for example age, size, growth rate, main issues or problems, structural variables may be the number of hierarchy levels, the structural form or the degrees of formalization and centralization. Within one model the stages are distinguished by different patterns and magnitudes regarding the employed variables (Hanks *et al.* 1993, p. 7). According to Bessant *et al.* (2005), especially early studies rely merely on formal criteria like size, age or growth rate and see transition in terms of an increase in turnover or the number of employees, while other studies make use of the other variables like the nature, the problems or the diversity of firms (pp. 8).

According to Hanks *et al.* (1993) life cycle stages may be best characterized by the definition of configurations by Miller & Friesen (1984b):

“Organizational structures, production systems, information processing procedures, strategies and environments all tend to influence each other. Our thesis is that they do so in such a manner that gives rise to a small number of extremely common configurations. [...] Configurations may represent common organization structures, common scenarios of strategy making in context, and even common developmental or transitional sequences.” (Miller & Friesen 1984b, p. 1 cited by Hanks *et al.* 1993, p. 7)

Table 2: Characteristics of the Five Main Life Cycle Stages (Hanks *et al.* 1993, tab. 3)

Dimension	Start-Up Stage	Expansion Stage	Consolidation Stage	Diversification Stage	Decline Stage
<b>Age</b>	Young	Young	Young	Older	Any Age
<b>Size</b>	Small	Small	Large	Largest	Declining
<b>Growth Rate</b>	Inconsistent	Rapid positive	Slow growth	Rapid positive	Declining
<b>Structural Form</b>	Undifferentiated, simple	Departmentalized, functional	Departmentalized, functional	Divisional	Mostly functional
<b>Formalization</b>	Very informal, personal flexible; Few policies	Formal systems begin to emerge, but enforcement is lax	Formal, bureaucratic; Planning & control systems are enforced	Formal, bureaucratic	Excessive bureaucratization
<b>Centralization</b>	Highly centralized in founder	Centralized; Limited delegation	Moderately centralized	Decentralized	Moderately centralized
<b>Business Tasks</b>	Identify niche; Obtain resources; Build prototype; Set up task structure	Volume production & distribution; Capacity expansion; Set up operating systems	Make business profitable; Expense control; Establish management systems	Diversification; Expansion of product market scope	Revitalization; Redefinition of mission and strategy

Besides the definition of a stage there is a great variety in the number of stages within life cycle theory, reaching from two to ten stages (see appendix A).

Nevertheless, a closer look at the models reveals a quite consistent description of venture development. Almost all models include at least one stage for each start-up, expansion and maturity. Several models additionally make use of a

diversification or revival stage. Only a few authors end with one or more decline stages (Hanks *et al.* 1993, pp. 9). These five main stages are characterized in Table 2.

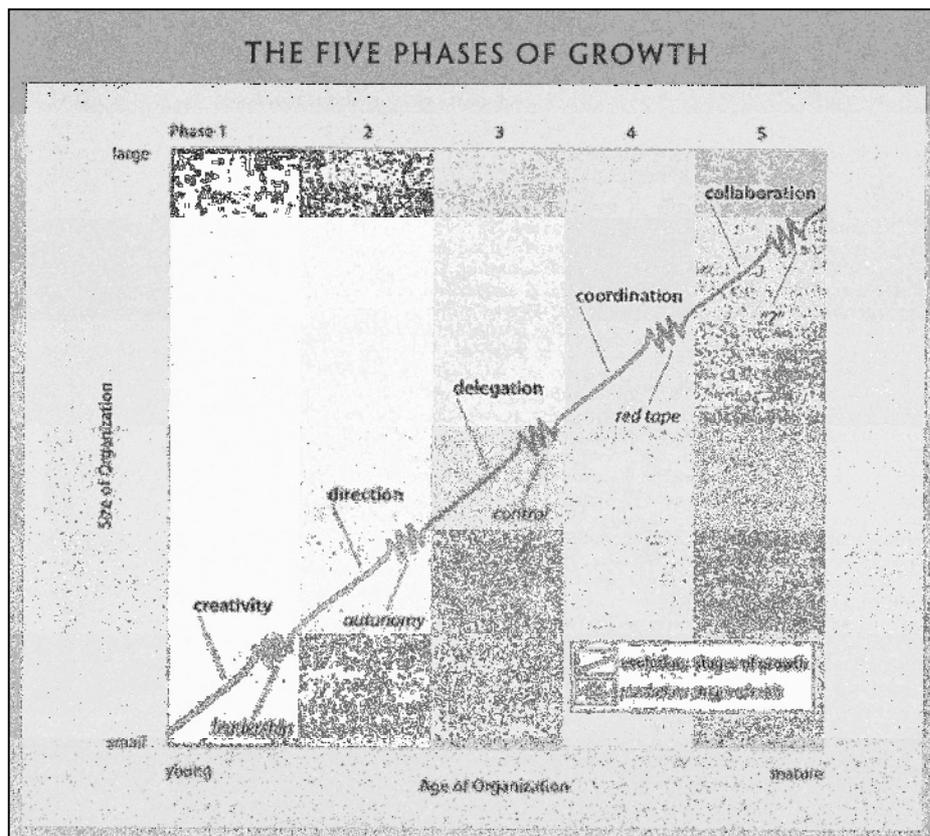


Figure 5: The Development of Organizations According to Greiner's Model (Greiner 1998, p. 58)

The probably most important work on venture life cycles is the one of Greiner from 1972 (Hanks *et al.* 1993, p.6), which was revised and updated by the author himself in 1998. Greiner (1998) identifies “a series of developmental phases through which companies tend to pass as they grow. Each phase begins with a period of evolution, with steady growth and stability, and ends with a revolutionary period of substantial organizational turmoil and change” (p. 56). The different stages are determined by age and size of the organization. The stages of evolution are quiet time periods of prolonged growth, where only minor adjustments are necessary. Stages of revolution are periods of considerable turbulences, between the smoother stages of evolution, typically characterized by substantial changes in management practice. These stages are critical to the further development of the organization and their main task is to find a new

arrangement of management practices which becomes the basis for the management of the next stage of evolution (ibid, pp. 56). The development path according to this fundamental model is illustrated in Figure 5. The organizational practices in the different phases of growth are characterized in Table 3.

Table 3: Organizational Practices in Greiner's Five Phases of Growth (Greiner 1998, p. 66)

Category	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
<b>Management Focus</b>	Make and sell	Efficiency of operations	Expansion of market	Consolidation of organization	Problem solving and innovation
<b>Organizational Structure</b>	Informal	Centralized and functional	Decentralized and geographical	Line staff and product groups	Matrix of teams
<b>Top-Management Style</b>	Individualistic and entrepreneurial	Directive	Delegative	Watchdog	Participative
<b>Control System</b>	Market results	Standards and cost centers	Reports and profit centers	Plans and investment centers	Mutual goal setting
<b>Management Reward Emphasis</b>	Ownership	Salary and merit increases	Individual bonus	Profit sharing and stock options	Team bonus

In his commentary to his first article, Greiner mentions that “there is obviously much more ‘death’ in the life of organizations” (Greiner 1998, p. 64) and thus not all companies pass through all stages of development. There are more overlaps between the phases than he originally stated and the stages of evolution consist of several miniphases. Furthermore, he is suggesting a sixth phase of extra-organizational solutions, alliances and cross-ownership. For knowledge organizations or service businesses he indicates a four-stage-model from entrepreneurial phase over a focusing and an expansion phase to a last phase of institutionalizing. He finally reminds, that his model is just a simple outline of the challenges a growing business is facing (ibid, pp.64).

A second fundamental work in life cycle theory regarding new technology-based ventures is the study of Kazanjian (1988). He suggests a four stage model where the stages of growth are defined by and aligned to their primary tasks. The model is derived from two case studies and the assumption that the development happens in the form of stages is not induced by Kazanjian but is introduced by both managers independently. The four stages are conception and development with the main tasks of resource acquisition and technology development, commercialization with the challenge of production related start-up, growth with sales/ market share growth and organizational issues and finally stability with the tasks of profitability, internal controls and future growth base (see Figure 6, Kazanjian 1988, pp. 261).

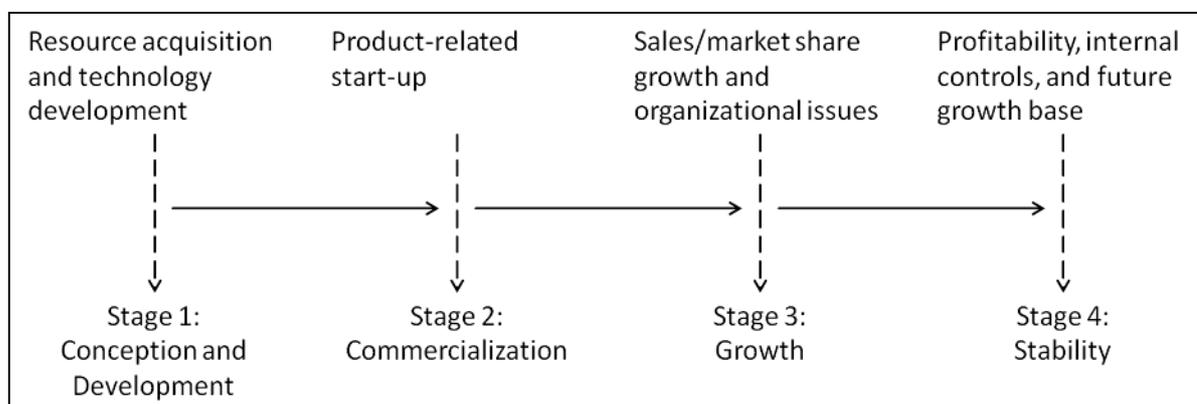


Figure 6: Relation of Dominant Problems to Stages of Growth (Kazanjian 1988, fig. 1)

The second part of Kazanjian's study provides empirical support ( $n = 105$ ) for the tasks related to the stages one and three. Empirical data show that different issues increase and decrease in importance over time, however, some problems are just more important in relation to the others all over the time. This finding might suggest that the stages are not defined by one single problem or a group of problems but by a hierarchical ordering of the problem factors. Furthermore, challenges and stage characteristics are not discrete and appear to overlap (Kazanjian 1988, p. 275). The importance of different subjects across the stages of growth is illustrated in Figure 7.

A different kind of life cycle model is the milestone model developed by Block & MacMillan (1985). Although the authors have a very practical view on the

underlying processes of venture creation and want to support guidance in the formation process, their work provides theoretical insights in the processes as well. Their ten milestones are: Completion of concept and product testing, completion of prototype, first financing, completion of initial plant test (or pilot operation for a service venture), market testing, production start-up, bellwether sale, first competitive action, first redesign or redirection and finally first significant price change (Block & MacMillan 1985, pp. 184).

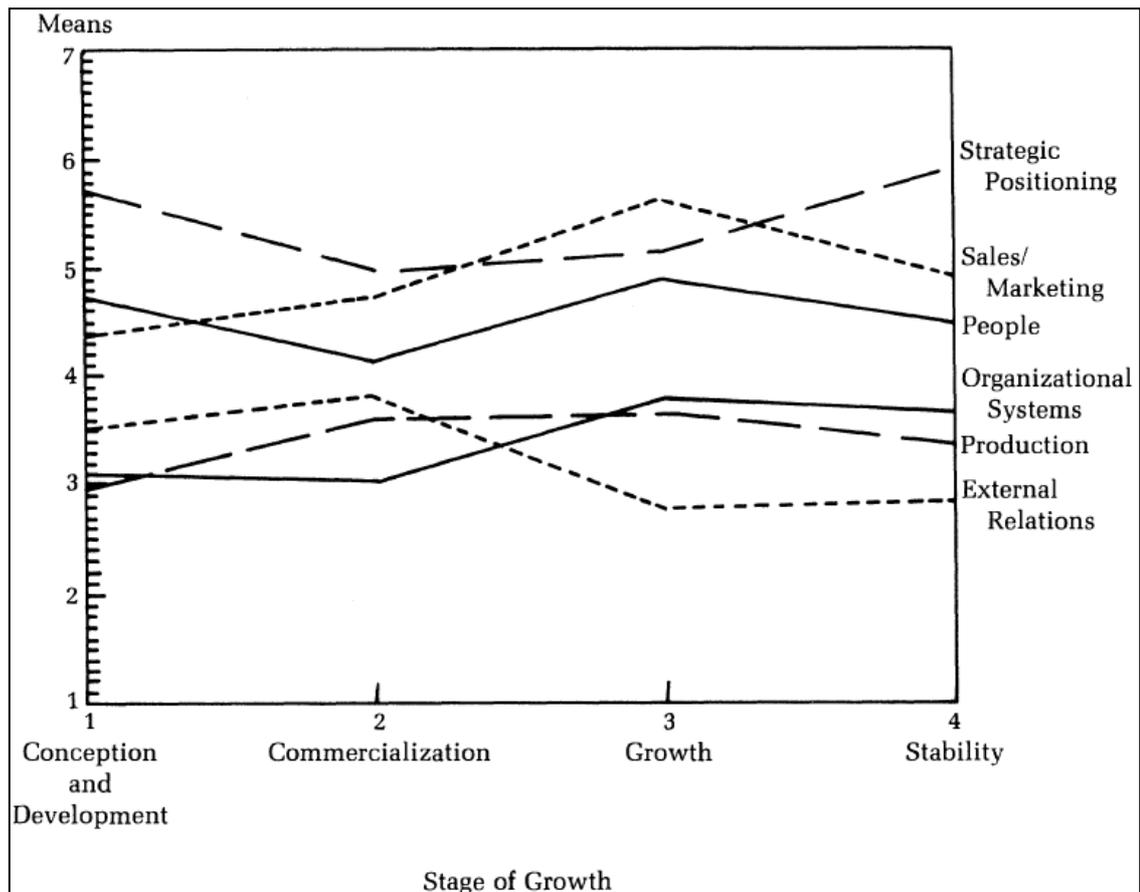


Figure 7: Dominant Problem Factors across Stages of Growth (Kazanjian 1988, fig. 2)

In their work Bessant *et al.* (2005) identify six tipping points that are critical to the development of a venture (pp. 33):

- People management: The field of human resources may have two critical steps. First, when the founding team has to be extended for the first time and second, when the employees may no longer be managed by the founders themselves.

- Strategy: Switching from an opportunistic approach of doing whatever is currently necessary to a formalized strategy to meet given goals. This process may be repeated with different products, markets or business models.
- Formalized Systems: Switching from informal processes of customer acquisition, information storage, controlling etc. to formalized processes ensuring consistency and helping to avoid unexpected failures. This tipping point may occur again when existing systems fail, do no longer meet the requirements or are below competitors' efficiency.
- New market entry: When entering new markets (customers, areas or products), organizations have to adapt or replicate their business model, scale up their business and understand new customer needs. These challenges occur again in each expansion stage.
- Obtaining finance: Moving from the initial funders to new sources of capital implies other pressures and constraints that are placed on the venture. This may be an issue at each capital acquisition.
- Operational improvement: Improving the operational processes through a deeper understanding of capabilities and best practices in fields like marketing and sales, distribution, supplier relationship and production.

The shown diversity in the detailed characteristics of life cycle models is described by Miller & Friesen (1984a): "While different authors have examined different variables in discussing organizational evolution, the consensus is that the nature of corporate development is quite structured. The anecdotal reports and the models described do seem rich and suggestive. Unfortunately, they are not based upon any strong empirical evidence gathered from longitudinal studies" (p. 1161). The problems of the use of different variables and the lack of strong empirical evidence are addressed within this work, preparing a longitudinal study Miller & Friesen call for.

### 2.2.4 Fields of Challenges

After the introduction of the fundamentals of entrepreneurship, academic entrepreneurship and venture life cycle theory, the fields of special challenges a venture is facing within its development process are examined now.

Based on Porter's Wheel of Competitive Strategy (Porter 1998, p. xxv), Frei (2006) developed a similar Wheel of Competitive Strategy adjusted to the special issues of high growth companies (see Figure 8, p. 18). According to this, the five fields of challenges are: marketing and distribution, organization, finance and control, management and technology.



Figure 8: Wheel of Competitive Strategy for High Growth Companies (Frei 2006, fig. 7)

#### *Marketing and Distribution*

The whole issue of marketing is of prime importance to new ventures. A survey among 200 Venture Capitalists, for example, revealed that marketing has with 6.7 of 7 points the highest priority of all management functions (Volkman & Tokarski 2007, p. 195). Special problems for technology-based ventures are the newness of the brand and its products or services and the related missing prominence as well as inexistent distribution channels. On the other hand, new ventures benefit from their informal structure and are more flexible and faster in reacting to changing market conditions and consumer needs (Frei 2006, p. 20; Volkman & Tokarski 2007, pp. 195).

### *Organization*

As organizations grow, the importance of formalized organizational structures increases. Greiner's five stages of growth are all disrupted by organizational crises, as mentioned in Figure 5. Usually, the development of the organizational structure lags behind the development of the firm itself and inefficiencies occur (Volkman & Tokarski 2007, p. 257). Oversized organizational structures have negative effects as well, as they restrict flexibility, creativity and personal responsibility (Frei 2006, p. 21; Volkman & Tokarski 2007, p. 257). The main issue for new ventures is to find always an appropriate level of formalization while the company continuously grows. This requires changes of processes and decision making and the evolution of a corporate culture (Frei 2006, p. 21)

### *Finance and Control*

In contrast to established companies, new ventures cannot easily raise a credit to cover their capital requirements. The financing of technology-based ventures may be provided by venture capitalists which are taking the big risk on the one hand but are aiming at high returns on the other hand (Frei 2006, p. 22; Volkman & Tokarski 2007, p. 305). Thus new ventures are dependent on the providers of risk capital. The management's ownership position can vary widely and may have an influence on the willingness to take risks. Financial controlling instruments are usually inexistent at the beginning and have to be established over time (Frei 2006, pp. 22).

### *Management*

New ventures are usually managed by the founding team, which quite often consists of the inventors of the technology but does lack special management experience (Helm & Mauroner 2007, p. 258). Actually the management team should be complementary regarding their skills (Volkman & Tokarski 2007, p. 122). Another special issue is the recruitment of new personnel, since a venture usually offers less secure salaries but big opportunities to new employees. Since a professional human resources department is mostly missing, recruiting is either

outsourced or happens unstructured. Thus growth of the company is very often limited by the problem of hiring new people (Frei 2006, p. 23).

### *Technology*

Of course the technology itself is of big importance to technology-based ventures. They have to manage their technology effectively and efficiently and need to undertake continuous Research and Development. Quite often new ventures lack a formal R&D department because the whole firm is dealing with the further development of the underlying technology. But with their products and services based on key innovations, new ventures are also facing an increased risk (ibid, p. 23).

Table 4: Comparison of Traditional and High Growth Companies (Frei 2006, tab. 1)

Category	Traditional Companies	High Growth Companies
<b>Marketing &amp; Distribution</b>	<ul style="list-style-type: none"> <li>– Proven business model with brand recognition and positioning (+)</li> <li>– Long history (+)</li> <li>– Established distribution (+)</li> </ul>	<ul style="list-style-type: none"> <li>– More flexible (+)</li> <li>– Innovative image (+)</li> <li>– Logistics and distribution (-)</li> <li>– Expensive customer acquisition (-)</li> </ul>
<b>Organization</b>	<ul style="list-style-type: none"> <li>– Established processes and slow grown organizations (+)</li> <li>– Long term view (+)</li> <li>– Can hinder innovation (-)</li> </ul>	<ul style="list-style-type: none"> <li>– More innovation possible (+)</li> <li>– Difficulties to establish organization (-)</li> </ul>
<b>Finance and Control</b>	<ul style="list-style-type: none"> <li>– Combined equity and loans (+)</li> <li>– Sound controlling (+)</li> </ul>	<ul style="list-style-type: none"> <li>– Dependency on risk capital (-)</li> <li>– Managements participation can be small (-)</li> <li>– Controlling instruments have to be developed (-)</li> </ul>
<b>Management</b>	<ul style="list-style-type: none"> <li>– Higher stability (+)</li> <li>– Professional human resources (+)</li> <li>– Lower potential (-)</li> <li>– Little corporate culture (-)</li> </ul>	<ul style="list-style-type: none"> <li>– Non monetary incentives (+)</li> <li>– Lack professional human resource department (-)</li> </ul>
<b>Technology</b>	<ul style="list-style-type: none"> <li>– Lower risk profile (+)</li> <li>– Vulnerable against competitors (-)</li> </ul>	<ul style="list-style-type: none"> <li>– Continuous innovation (+)</li> <li>– Competitive advantages through technology (+)</li> <li>– High R&amp;D spending (-)</li> </ul>

Table 4 summarizes the main differences between traditional and high growth companies.

### 2.3 OECD/EUROSTAT Entrepreneurship Indicators Programme (EIP)

Triggered by the growing attention to entrepreneurship, European policy makers and statisticians noted the gap of lacking comparability of entrepreneurship ecosystems and wanted to overcome this shortcoming. Therefore the OECD/EUROSTAT Entrepreneurship Indicators Programme (EIP) was started to improve the comparability through the creation of a common measurement for entrepreneurship (Ahmad & Hoffman 2008, pp. 2). Besides essential definitions for entrepreneurs, entrepreneurship and entrepreneurial activity, the EIP provides the OECD/EUROSTAT framework for entrepreneurship indicators as illustrated in Figure 9. “This model establishes a simple framework so that consistent, comparable and relevant data collection can proceed” (Ahmad & Hoffman 2008, p. 7).

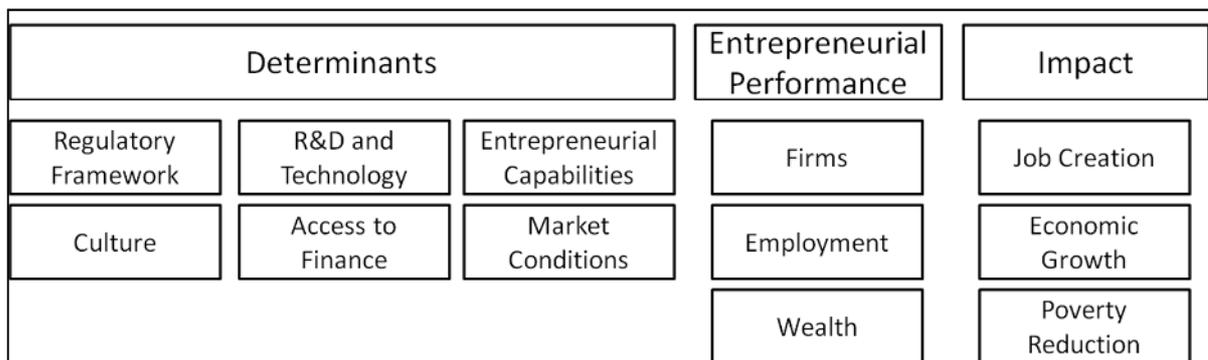


Figure 9: The OECD/EUROSTAT Framework for Entrepreneurship Indicators (Ahmad & Hoffman 2008, fig. 5)

Since this international initiative employs a policy perspective and thus focuses mainly on the impact of entrepreneurship by using a top-down approach starting from the policy goals, the developed framework is not of prime importance to this work. Nevertheless, it supports the aim of this work to create a harmonized instrument for the analysis of technology-based ventures, because comparable and broad data is not available so far, but absolutely necessary for a deeper understanding of entrepreneurial processes.

### 3. Questionnaire

This chapter deals with the questionnaire itself, the actual instrument to track the development process. Therefore the questions will be stated and the underlying theory will be summarized. In the end of this chapter, the results of the pretests will be reported and the implementation will be described.

#### 3.1 Questions

When developing a study to track the development of technology-based ventures the main question is which criteria should be tracked. Since the length of a questionnaire is a critical trade-off between gaining a higher response rate through a shorter questionnaire and recording more information through more questions, one cannot simply include all issues of interest in one questionnaire. The following paragraph states the 45 questions, divided into the seven categories contact information (5), general information (12), connections to university (7), finance (6), founding team (5), business concept and technology (5), and market and competition (5). The complete questionnaire is appended to this work (appendix B).

##### 3.1.1 Contact Information

The questionnaire starts with a first and foremost purely organizational part, when asking for the contact information. This part is divided into name and address of the company (see Figure 10) and name, function and contact information of the respondent (see Figure 11).

Name and Adress of your Company		
<input type="text"/>		
Name		
<input type="text"/>	<input type="text"/>	<input type="text"/>
Street and number	Zip code	and city

Figure 10: Contact Information 1 & 2

These questions serve primarily organizational issues. Nevertheless, at least the information about the zip code is of scientific relevance. With the zip code of the

company's address one can calculate the approximate distance between university and the company's headquarter. This distance is of scientific relevance, since spatial proximity is thought to enhance cooperation between the new firm and the incubator (Egeln *et al.* 2002, p. 45).

Name, Function and Contact Information of the Respondent	
<input type="text"/>	<input type="text"/>
First and last name	Function within the company
<input type="text"/>	<input type="text"/>
Phone number	E-mail address

Figure 11: Contact Information 3, 4 & 5

Egeln at al. (2002) find that one of three spin-offs has its first office in direct vicinity of the incubator, i.e. in less than 10 kilometers distance. More than 60 % of the spin-offs have their first office at least in the same region (less than 50 kilometers) and only one fourth is more than 100 kilometers away (pp. 45). These findings are supported by data from the Technische Universität Berlin. 60 % of the spin-offs stay in Berlin, 6 % in Brandenburg, 11 % in other regions of Germany and 24 % of the firms have their headquarter in foreign countries (Matuschka & Fajga 2011, p. 27).

Usually the vicinity of the university “provides a high quality of life, a suitable infrastructure, high attraction for external capital, a vicinity to other research key players and easier knowledge transfer” (Helm & Mauroner 2007, p. 254). Other factors influencing the choice of office location are nearness to business partners, local and regional markets, capital availability, political factors like taxes and subsidies and the international experience of the founding team (ibid).

Another piece of information that can be derived from these answers is the legal form of the company which is included in the company's name. Helm & Mauroner (2007) see advantages in the most frequently used form of a public or private limited company. Public or private limited companies are open for partners and stakeholders and ventures using this legal form seem to be more successful (p. 258).

### 3.1.2 General Information

After the two starting questions on contact information the questionnaire deals with general information about the company. This section is used to categorize the firm within the sample of spin-offs and start-ups and provides some performance indicators and further characteristics.

In which year was your company legally founded?	<input type="text"/>
---	----------------------

Figure 12: General Information 1

First, the year of the company's legal foundation is recorded (see Figure 12). The age of a company serves as control variable on the one hand; on the other hand it is of prime importance for the life cycle theory introduced in paragraph 2.2.3. It is a contextual variable, characterizes the stage of growth and therefore may be correlated with the main problems a venture faces within its development process. Furthermore, the age of a company is necessary to determine the company's growth rate and helpful for descriptive statistics.

Regarding the turnover, Kulicke & Görisch (2002) identify the age of the company as the only correlated variable. Neither characteristics of the founding team nor the industry sector showed statistically significant connections (p. 26). Furthermore, connections to university become less important with the company growing older (ibid, p. 65).

Is your company still existing?	<input type="radio"/> Yes	<input type="radio"/> No
If not: Why does your company not exist anymore?		
<input type="radio"/> Sold	<input type="radio"/> Abandoned	<input type="radio"/> Other: <input type="text"/>

Figure 13: General Information 2 & 3

The following two questions concern the present existence of the company (see Figure 13). The respondent is asked whether the company he founded is still existing or not. If it does not exist anymore, the subsequent question deals with the continuance of the company. These questions are important for descriptive statistical analysis, because firms that are no longer in ownership of the founder or that have been closed can be recorded as well.

Even more importantly, however, the continuance of a company serves as a performance indicator. It is obvious that firms that had been abandoned might probably be less successful than firms that still exist, regardless of whether they are still in ownership of the founding team or already sold. Further investigations may differ between still owned and already sold firms in terms of performance, as well.

In which of the following industries is your company active in?		
<input type="radio"/> Biotechnology	<input type="radio"/> Construction/Architecture/Planning	
<input type="radio"/> Trade Sector	<input type="radio"/> Mechanical Engineering/Vehicle Manufacturing	
<input type="radio"/> Consulting	<input type="radio"/> Electrical Engineering/Telecommunications	
<input type="radio"/> Energy Sector	<input type="radio"/> Chemical/Pharmaceuticals	<input type="radio"/> IT/Internet/Web 2.0
<input type="radio"/> Art/Culture	<input type="radio"/> Marketing/Media	<input type="radio"/> Medical Technology
<input type="radio"/> Research	<input type="radio"/> Environmental Technology/Water	<input type="radio"/> Social/Health Sector
<input type="radio"/> Education	<input type="radio"/> Other:	

Figure 14: General Information 4

The next question asks about the industry sector of the company (see Figure 14). Besides descriptive significance the industry sector also serves as control variable, since different performances of the firms may purely be based on different developments within the various industry sectors.

Egeln *et al.* (2002) find that nine out of ten ventures within research- and knowledge-intensive industries are assigned to technology-oriented and knowledge-intensive services, like IT/internet/web 2.0, research, consulting, marketing/media and education. Only one tenth of firms in research- and knowledge-intensive industries are founded in research-intensive, manufacturing industries, so called high-tech industries (pp. 14; see also Kulicke & Görisch 2002, p. 28). Although spin-offs in high-tech industries play a minor role within the total amount of foundations, they play a pivotal role within its sector itself. About half of the foundations in the biotechnology sector have been exploitation spin-offs (Egeln *et al.* 2002, p. 16).

Table 5: Impact of particular industrial sectors on spin-off success (Helm & Mauroner 2007, table 9)

Study	Industrial Sector	Impact on spin-off success
Egelin et al. (2003)	Mechanical engineering, communication/electronics, medical engineering, instrumentation, control engineering, optics, automotive	Positive impact on sales expectancy
Egelin et al. (2003)	Research intensive consumer goods, computer, business consulting, advertising/media, legal and tax advice, accounting	Negative impact on creditworthiness
Shane & Stuart (2002)	Semiconductor	Favourable for venture capital acquisition
Hunsdiek (1987)	Consumer goods	Generally positive impact on success dimensions
Egelin et al. (2003)	Technical service, research and development service, business service, health care, education, software	Generally negative impact on success dimensions
Egelin et al. (2003)	Computing service, chemicals and pharmaceutical, electrical engineering	Ambiguous impact on success dimensions

Some studies within the field of academic spin-offs even see the industry sector as success factor and find a correlation between industry sector and spin-off success (see Table 5, Helm & Mauroner 2007, p. 255).

Please state, how your turnover is distributed between the provision of products and services. (a total of 100 %)	Provision of products:	<input type="text"/> %
	Provision of services:	<input type="text"/> %

Figure 15: General Information 5

The following question focuses on the distribution of turnover between services and products (see Figure 15). According to the previous remarks, the share of services might be predominant. Nevertheless, this question is not superfluous. Even if a firm is assigned to a non-manufacturing sector, previously called a sector for technology-oriented and knowledge-intensive services, it does not necessarily concentrate on selling services. An IT-firm selling software, for

example, will be assigned to the IT sector but generate turnover through products. Hence these two questions record two different issues, with the second one characterizing the business model.

Please state, how your turnover is distributed between consumers (B2C) and other businesses (B2B). (a total of 100 %)	Consumer (B2C):	<input type="text"/>	%
	Other Businesses (B2B):	<input type="text"/>	%

Figure 16: General Information 6

Characterizing the business model as well, the subsequent question asks about the distribution of turnover between the customers of the firm (see Figure 16). Therefore the customers are categorized into final consumers (B2C) and business customers (B2B).

This distinction is elementary for the marketing concept, since two very different kinds of target groups are addressed. While companies with B2B focus deal with a relatively small number of customers whose names are often known and who are easy to contact, companies with B2C focus often deal with millions of individuals which are often seen as a grey mass of potential customers and are relatively hard to contact. Furthermore, with the business customer offering quite large purchase volumes and such items like profit sharing, the business customer can expect a customized service in return. Hence the relationship between a firm and a business customer is likely to be much more intensive than the one between a firm and an individual consumer (Zinkhan 2002, p. 84; see also Gummesson 2004, p. 137).

Please state the number of employees for the end of your first fiscal year in full-time equivalents (including you, excluding freelancers).				
...for the <u>first</u> fiscal year:				
<input type="radio"/> 1 - 5	<input type="radio"/> 6 - 20	<input type="radio"/> 21 - 50	<input type="radio"/> 51 - 100	<input type="text"/>
<input type="radio"/> 101 - 250	<input type="radio"/> 251 - 500	<input type="radio"/> 501 - 1000	<input type="radio"/> More, namely:	
...for the <u>last</u> fiscal year:				
<input type="radio"/> 1 - 5	<input type="radio"/> 6 - 20	<input type="radio"/> 21 - 50	<input type="radio"/> 51 - 100	<input type="text"/>
<input type="radio"/> 101 - 250	<input type="radio"/> 251 - 500	<input type="radio"/> 501 - 1000	<input type="radio"/> More, namely:	

Figure 17: General Information 7 & 8

The next questions record the number of the company's employees for the end of the first and the last fiscal year (see Figure 17). Thereby the growth of the firm regarding the dimension of employment can be tracked, which serves as a performance indicator and the number of people employed by the firm serves for descriptive statistics as well. Furthermore, the size of the staff is a success factor.

With too many employees, fix costs are too high, organizational tasks lead to unnecessary coordination costs and the flexibility and adaptability is limited. Due to these disadvantages and with risk aversion, information asymmetry and idiosyncratic behavior, new companies usually have too few employees. This in turn implies unfavorable cost structures and inefficiencies and some resources are bound by the growth to an efficient size, however. In case of market acceptance new companies then show high growth rates within its first years (Egeln *et al.* 2002, p. 50; see also Kulicke & Görisch, pp. 21).

Please state the percentage of employees with a university degree within your company.					
<input type="radio"/> 0 %	<input type="radio"/> 1 - 25 %	<input type="radio"/> 26 - 50 %	<input type="radio"/> 51 - 75 %	<input type="radio"/> 76 - 99 %	<input type="radio"/> 100 %

Figure 18: General Information 9

The subsequent question records the share of academics within the company's staff (see Figure 18). On the one hand this question provides more detailed, descriptive information about the effects on employment. On the other hand, technology-based ventures and university spin-offs might acquire their personnel from university as well and hence show a higher share of academics within the staff than other companies do.

In Berlin, 59 % of the firms employ staffs with more than 75 % academics. Only 29 % of the firms do not have a majority of academics within their staff (Matuschka & Fajga 2011, p. 52).

The next questions deal with the amount of the company's turnover (see Figure 19) and thus serve information to growth and success of the company, like the questions dealing with employment do. Similar to the development of

employment, technology-based ventures usually show high growth rates in turnover within their first years of operation.

Please state your company's amount of turnover for your last fiscal year. (in Euro)

...for the first fiscal year:

0   
 >0 - 50.000   
 >50.000 - 250.000   
 >250.000 - 500.000   
 >500.000 - 2.000.000  
 >2.000.000 - 10.000.000   
 >10.000.000 - 50.000.000   
 More, namely:

...for the last fiscal year:

0   
 >0 - 50.000   
 >50.000 - 250.000   
 >250.000 - 500.000   
 >500.000 - 2.000.000  
 >2.000.000 - 10.000.000   
 >10.000.000 - 50.000.000   
 More, namely:

Figure 19: General Information 10 & 11

In Berlin, more than half of the firms gain revenues between one and 50,000 Euro in their first fiscal year. 8 % do not have any revenues and 29 % generate a turnover between 50,000 and 250,000 Euro (Matuschka & Fajga 2011, p. 54).

Has your company already achieved operating profits in one of the previous fiscal years?

Yes, fiscal year number:    
 No, expected for fiscal year number:

Figure 20: General Information 12

The subsequent question asks if operating profits have already been achieved and when this has happened or when it is planned to happen (see Figure 20). This information serves as a performance indicator. As already mentioned within the discussion of venture life cycle theory, ventures may generate turnover without operating profits. In the first time of existence, expenses are likely to exceed revenues, since the company has to invest into bringing the product or service to market, new offices, customer acquisition or other processes starting a business. The time of the first positive fiscal year might show significant correlations with firm success in terms of growth. Furthermore, the longitudinal study enables investigations whether the time of the first operating profits was met or if a delay has occurred.

In Berlin, 58 % of the firms which have already achieved operating profits achieved this in their first fiscal year; 20 % in their second and 12 % in their

third. Companies without operating profits so far expect operating profits for their third year on average (Matuschka & Fajga 2011, p. 56).

### 3.1.3 Connections to University

With the contact and general information at the beginning of the questionnaire, section three is more specific and asks about the company's connections to university. These questions are of prime importance for the research field of academic entrepreneurship and characterize the venture in terms of technology transfer, cooperation with university partners, role of the university within the founding process etc.

Would you classify your company as a spin-off, through which a technology or knowledge transfer from a regional university occurred?			
<input type="radio"/> Yes	<input type="radio"/> Partially	<input type="radio"/> Marginally	<input type="radio"/> No, not at all

Figure 21: Connections to University 1

The first question asks the respondent to classify his firm in terms of the underlying technology transfer (see Figure 21) and thus gives information about the extent of technology transfer that has happened. According to the definition of university spin-offs from Acatech (2010) as introduced in paragraph 2.2.2, this is one of three possible criteria for a university spin-off.

According to Rogers (1995) “a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome” (p. 35). Technology transfer is the transfer of technological and technology related know-how between partners (persons, institutions and firms) to improve at least one partner's knowledge and skills (Abramson 1997, p. 2). The transfer process usually involves a source of technology that has specialized skills and the actual transfer of technology to the partner who lacks these skills and cannot create them himself (Williams & Gibson 1990 cited by Steffensen *et al.* 2000, p. 96). “Technology transfer can occur in many different ways like via informal interactions between individuals, formal consultancies, publications, workshops, personnel exchanges, [...] joint projects involving groups of experts from different organizations, [...] patenting, copyright licensing and contract

research” (Abramson 1997, pp. 2). The spin-off itself is also one kind of technology transfer because the new firm is usually founded to commercialize a technology which originated in a research institution (Steffensen *et al.* 2000, p. 96).

Besides the spin-off the most important means of technology transfer in the field of academic entrepreneurship are informal interactions, publications, personnel exchanges, patenting, copyright or technology licensing and contract research.

Efficient knowledge and technology transfer is an important factor in the competition of economies. In Germany one out of seven foundations in the high-tech sector commercializes research results from public research institutions (Acatech 2010, p. 5).

Have you or has another person of your founding team been at university as the last position before foundation (either as student or employee)?	
<input type="radio"/> Yes	<input type="radio"/> No

Figure 22: Connections to University 2

The second question within this section deals with the issue, if at least one member of the founding team has been at university directly prior to foundation (see Figure 22). This addresses the second criterion of the definition from Acatech (2010) introduced in paragraph 2.2.2.

Egeln *et al.* (2002) distinguish between the terms incubator and institutional origin. The incubator is the institution, from which research results or new scientific methods come from, or where special skills have been learned. The institutional origin is the institution where the founders have been as last position, either as employee or student. Institutional origin of the founders and incubator of the firm are in 80 % of the cases identical (p. 29).

Kulicke & Görisch (2002) find in their study of all innovative or technology-oriented companies founded between 1996 and 2000 that 31.6 % of these companies have been founded by at least one founder who has been at university or a research institution directly prior to foundation. Figure 23 illustrates the

composition of the 285 founding teams regarding the institutional origin of the team members.

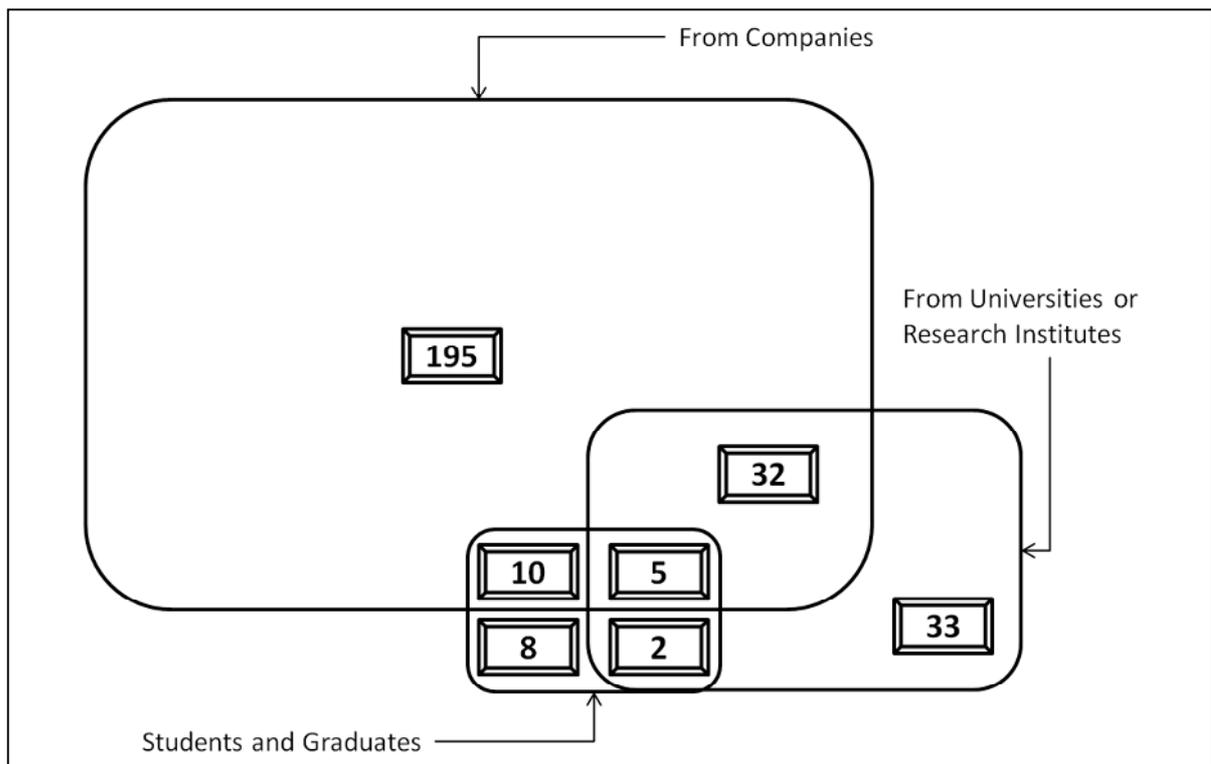


Figure 23: Compositions of the Founding Teams Regarding the Institutional Origins (Kulicke & Görisch 2002, figure 21)

Was or is a university shareholder of your company (directly or indirectly)?

Yes  No

Figure 24: Connections to University 3

The third question completes the definition of Acatech (2010) and asks if the university holds an equity stack of the firm (see Figure 24). There is little to no data available for German universities. It can be estimated that universities do not very often act as investors of competence spin-offs. A higher financial involvement is probable in exploitation spin-offs, since a formal technology transfer takes place and the higher non-financial involvement of the university through patent transfer or licensing might lead to a stronger interest in the success of the new venture and hence to an additional financial involvement.

According to Helm & Mauroner (2007), a financial involvement of the university may not necessarily be an indication for success, but may be caused by an

inability to raise other forms of financing. Founders and parent have different opinions about what kind of support is useful. Founders seek to reduce personal risk, while parents look for efficiency of technology transfer and firm growth (p. 254).

Deriving from which department of your university your company has been founded?

<input type="checkbox"/> Architecture	<input type="checkbox"/> Civil Engineering, Geo- and Environmental Sciences
<input type="checkbox"/> Chemistry and Biosciences	<input type="checkbox"/> Chemical and Process Engineering
<input type="checkbox"/> Humanities and Social Sciences	<input type="checkbox"/> Electrical Engineering and Information Technology
<input type="checkbox"/> Informatics	<input type="checkbox"/> Mechanical Engineering
<input type="checkbox"/> Mathematics	<input type="checkbox"/> Economics and Business Engineering
<input type="checkbox"/> Physics	

Figure 25: Connections to University 4

The following question asks about the origin of the venture regarding the university department (see Figure 25). This issue is mainly of descriptive interest. Which departments generate most new ventures? Where does most technology transfer occur and what kinds of firms derive from which department?

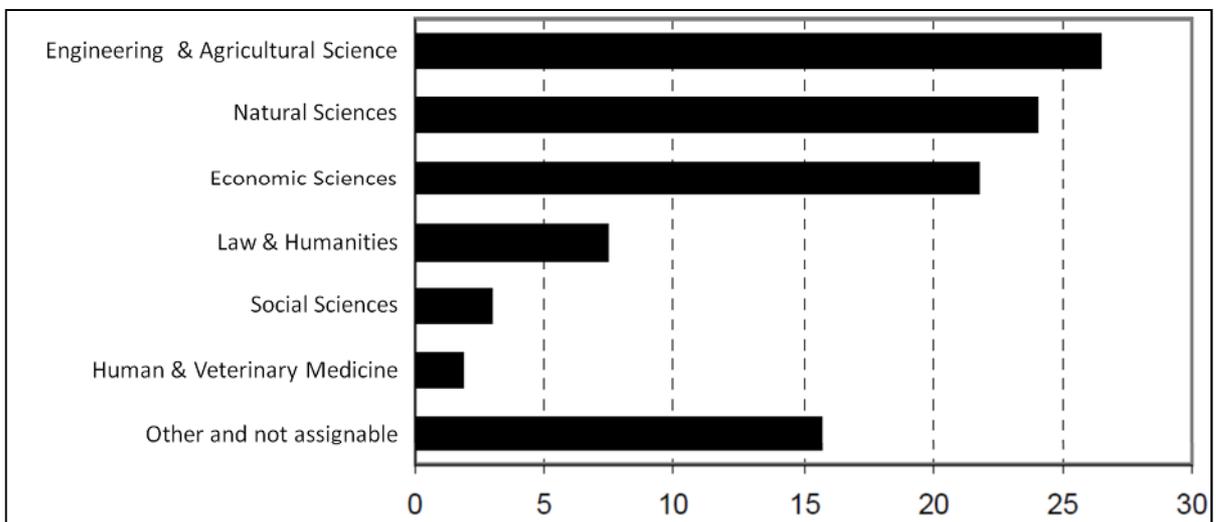


Figure 26: Origin of Spin-Off Founders Regarding the Field of Study in Germany 1996-2000 (Egeln *et al.* 2002, figure 30)

The origin regarding the university department means the area the researcher was doing research in lastly or the area of the subject the student was studying. Egeln *et al.* (2002) find spin-off activities over all fields of study with a dominance

of agricultural sciences and engineering, natural sciences and economics (Egeln *et al.* 2002, p. 35; see Figure 26).

Which kind of offerings and services of founding support at your university did you use and how helpful have they been?

	Helpful	Less helpful	Not used
<b>Personal Support</b>			
● Personal coaching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Further education/training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Mentoring program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Personal assistance from a professor, namely: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Technical Support</b>			
● Professional coaching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Support for the development of a prototype	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Support for the creation of a market study	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Technical assistance from a professor, namely: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Use of Resources</b>			
● Direct (partial) funding from the university	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Use of the expertise of university facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Use of premises of the university	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Use of the Network of the University</b>			
● Support for the funding (e.g. EXIST)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Relationships with venture capitalists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Provision of appropriate co-founders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Mediation of business contacts and relationships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
● Provision of other contacts and networks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 27: Connections to University 5

The subsequent question goes into more detail and deals with the support the venture has received (see Figure 27). Four main categories are considered: personal support, like personal coaching or mentoring; technical support, like professional coaching, help with the development of prototypes or the creation of a market studies; provision of resources, like funding or the provision of facilities and the provision of networks, like the mediation of contacts to venture capitalists, co-founders or business partners. Respondents are asked to rate all support services as helpful or less helpful if they have been used.

Various studies deal with the effects of spin-off support by the parental organization. Financial involvement of the parent, mentoring, professional training and education and relationships with venture capitalists show influence on the entrepreneurial commitment and partially on spin-off success. Network integration by the parent leads to a better network integration of the spin-off (Helm & Mauroner 2007, table 8).

Kulicke & Görisch (2002) identify four main kinds of support services by universities: consulting and coaching by employees and mentoring; provision of premises, infrastructure and facilities; more favorable cooperation contracts and easier access to resources in terms of knowledge, technology and contacts (pp. 52).

About one third of the spin-offs founded between 1996 and 2000 have received founding support, with a big difference between competence spin-offs (28 %) and exploitation spin-offs (40 %). Regarding the importance or the influence on the venture's development, the provision of premises or other infrastructure has been rated best: more than half of the spin-offs rate this kind of support as very important. Educational services have been rated worst: 40 % of the supported spin-offs rate these services as less helpful (Egeln *et al.* 2002, pp. 48).

Informal contacts are the most frequently used kind of support in the foundation process and are rated as very important by 35 % of the firms making use of this form. These contacts serve for suggestions for own research activities, quick and informal consulting and use of the networks of professors and colleagues (Egeln *et al.* 2002, p. 49).

The following questions do not deal with the founding support, but with the ongoing support by and connections to university (see Figure 28). Diverse forms are possible, from informal contacts to R&D cooperation. Furthermore, for descriptive statistical reasons the professor to whom these connections exist is tracked. Hence chairs very active in maintaining connections to ventures can be identified.

Are there currently contacts between your company and a department of your university?

Regular informal contacts
  Internships/theses of students  
 Usage of the infrastructure
  Other collaborations  
 R&D cooperation
  There are currently no cooperations

These cooperations exist mainly with the following professor or institution:

\_\_\_\_\_

Figure 28: Connections to University 6 & 7

Ongoing connections to university can be a very important competitive factor. Spin-offs and university can benefit from these connections, since market, production and service competences meet research know-how. Very often these connections are just a continuation of the networks build in the time of employment or studies or during the time of founding support (Egelin *et al.* 2002, pp. 37).

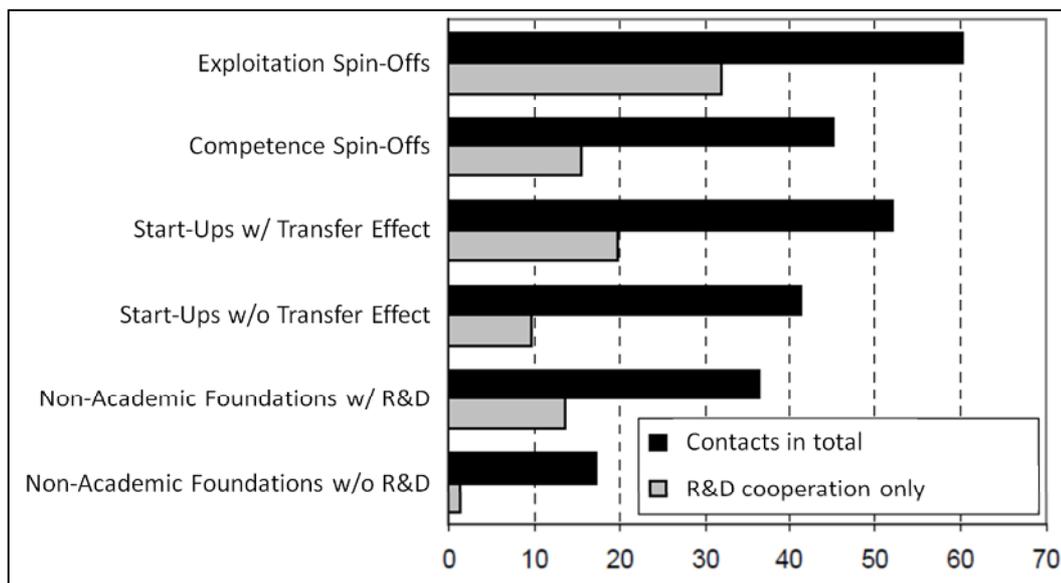


Figure 29: Ongoing Connections to Research Institutions by Venture Types (Egelin *et al.* 2002, fig. 33)

Figure 29 illustrates the frequency of connections to university over the different kinds of spin-offs and start-ups. Exploitation spin-offs show most frequently these connections (60 %). The most widely used form of connections to university is informal contacts. Half of the exploitation spin-offs state this kind of connection (Egelin *et al.* 2002, pp. 37). This finding is not very surprising, since

informal contacts are the most common form for founding support services as well.

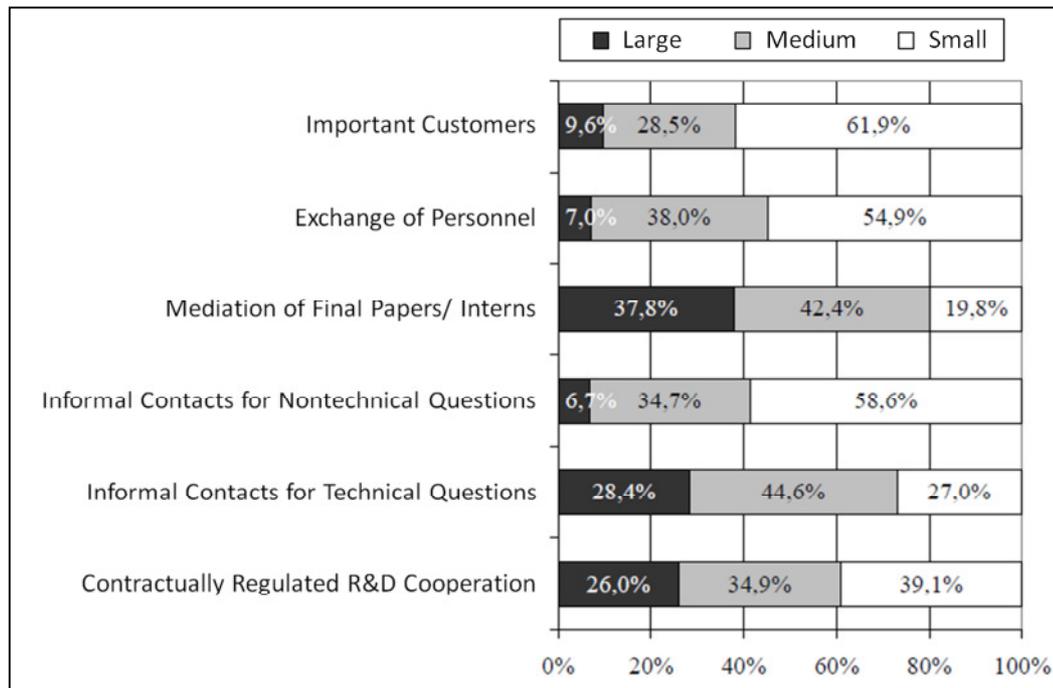


Figure 30: Importance of Universities and Regional Research Institutions (Kulicke & Görisch 2002, figure 28)

Regarding the question, what meaning do universities or regional research institutions have for your company, Figure 30 illustrates the answers. The most important connection – independent from frequency – is the mediation of final papers and internships. Second are informal contacts and third R&D cooperation (Kulicke & Görisch 2002, pp. 60; see Figure 30).

### 3.1.4 Finance

The fourth section of the questionnaire is about financial issues. Financing a venture is one of the most critical points in the first years of existing as introduced in paragraph 2.2.4, since technology-based ventures are normally involving high risk and high growth at the same time. This means that there is a high need for capital which is not easy to satisfy.

The key role of the capital acquisition is underlined by Figure 31. It shows that the lack of sources of financing is the number one obstacle for spin-off foundations.

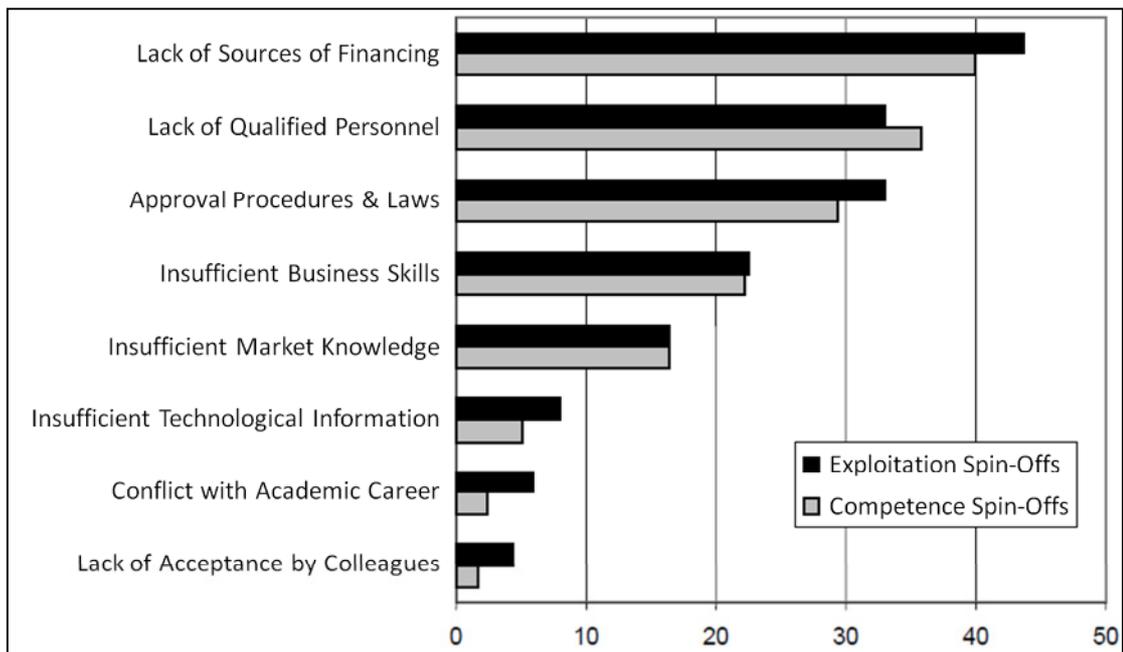


Figure 31: Obstacles for Spin-Off Foundations (Egelin *et al.* 2002, fig. 41)

Due to this outstanding importance of gaining capital, success of ventures is sometimes also measured in terms of resources and especially capital they are able to acquire (Clarysse 2007, p. 610; Helm & Mauroner 2007, p. 241).

Have you raised equity capital (e.g. venture capitalist, business angel) for the financing of your company?

Yes  No

Figure 32: Finance 1

The first question to finance is if equity capital (or venture capital) has been raised or not (see Figure 32). It is a filter question for some further questions to finance.

In Berlin, less than 25 % of the ventures raise venture capital in the first two fiscal years (Matuschka & Fajga 2011, p. 33).

If not: Why has no equity capital been raised?

No equity capital could be acquired.  It is planned to raise equity capital.

It was not necessary to raise equity capital.

Figure 33: Finance 2

If no equity capital has been raised, the question arises why this is the case. Essentially, there are three possibilities: either it was not possible to gain capital, no capital has been raised yet, but it is planned to do so or it was not necessary to raise venture capital (see Figure 33).

If it was not possible to raise venture capital this might be an indicator for different aspects. In a survey, Bruno & Tyebjee (1985) asked the firms why they were denied venture capital funding. The firms themselves name as the decisive factors market potential, competition and product feasibility in half of the cases. The authors also asked the venture capitalists about the main reasons to reject investments. From the investor's view in one third of the cases investment was refused due to deficiencies in the management of the ventures (p. 70).

Since more than two thirds of the ventures denied funding stay in business (ibid, p. 69), this is an interesting group of firms and the investigation of differences between the development of funded and not-funded ventures might be very informative.

Which kind of equity capital have you raised or do you plan to raise?

<input type="checkbox"/> Family, friends and fools <input type="checkbox"/> Business Angel <input type="checkbox"/> Crowd Funding <input type="checkbox"/> Independent venture capitalist <input type="checkbox"/> Corporate venture capitalist <input type="checkbox"/> Other private investors, namely	<input checked="" type="checkbox"/> Public venture capitalist, namely <input type="checkbox"/> High-Tech Gründerfonds (HTGF) <input type="checkbox"/> KfW (ERP-Kapital) <input type="checkbox"/> Other public investors, namely
---	--

Figure 34: Finance 3

If venture capital has been acquired, the respondent is asked to state the form of venture capital that has been raised (see Figure 34). Mainly three groups of sources are considered: personal investors, institutional investors and public investors.

The different sources of finance are categorized in informal and formal investors. Informal investors do not have a separation of the lenders of capital from the managers of the capital like formal investors do (Schefczyk 2007, p. 11). All forms

of venture capital have different implications on the funded venture. An overview of the most important sources is given in Figure 35.

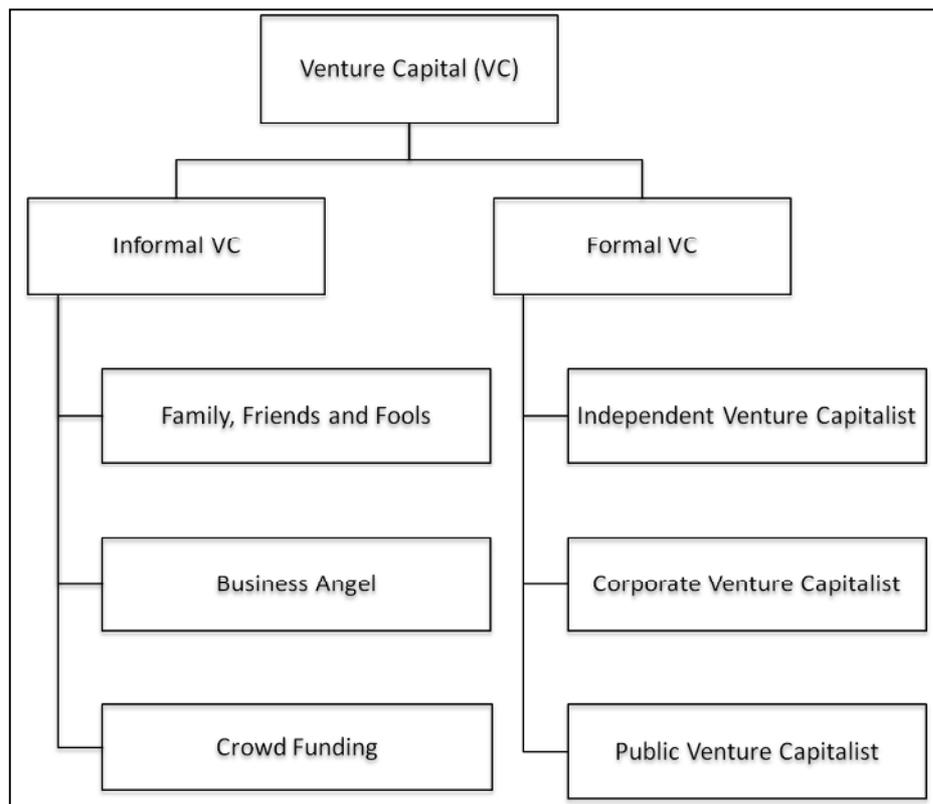


Figure 35: Forms of Venture Capital

The first informal form of venture capital is family, friends and fools. Investors from the personal environment of the founders usually use dormant equity holdings. The advantage of the confidential relationship goes along with the risk of personal conflicts that threaten the venture's future. However, the capital gained through family, friends and fools normally cannot satisfy the capital requirement of a fast growing venture for too long, so this source of equity loses importance quite early (Volkman & Tokarski 2007, p. 319).

The second informal form of venture capital investors is business angels. Business angels are persons who invest their personal capital. These persons quite often are former entrepreneurs or managers who not only have a financial motivation. Hence they may be interested in funding a new company or in passing on their knowledge to young entrepreneurs as well. Through the waiver of too formal control mechanism and the provision of branch-specific knowledge

and networks, business angels serve as a kind of mentor and can be very beneficial for entrepreneurs (De Clercq *et al.* 2006, p. 93; Volkmann & Tokarski 2007, pp. 319).

The third informal form is crowd funding. This type of venture capital is relatively new. The firm seeking capital contacts a set of (previously unknown) small investors and raises capital from them via crowd funding platforms. Regarding the right to control and the amount of investment crowd funding is positioned between family, friends and fools and business angels (Fueglistaller *et al.* 2012, p. 284).

The first formal source of venture capital regarded is the independent venture capitalist. Independent venture capitalists pursue primarily monetary targets; strategic targets are of minor importance. They manage the capital of banks, pension funds, insurance companies and sometime personal investors and invest into young high-growth companies in order to sell them with high returns. The venture capitalist manages the whole process from investment decision over venture support to divestment (Dushnitsky & Shapira 2010, p. 993; Rider 2009, p. 582; Schefczyk 2007, p. 11).

The second formal source is the corporate venture capitalist (CVC). CVCs usually do not only pursue monetary targets but also strategic targets, since they are part of a parent company which is normally active in the same or a related industry sector. Hence they are also looking for opportunities to enter new markets or gain new technologies through the investment in young firms. The big advantage of CVCs are the branch-specific network, knowledge and own research facilities (Dushnitsky & Shaver 2009, p. 1047; Weber 2009, p. 195; Dushnitsky & Shapira 2010, p. 991).

Third are public venture capitalists. Governments do not only set the legal and fiscal environments investors operate in, they sometime also act as investors themselves. In Germany, the nationwide most important public venture capital investor is the High-Tech Gründerfonds (HTGF), which was set up 2005 for the first time and again in 2011. Public venture capital funds are politically justified

mainly by the argument that R&D expenditures generate positive spillovers other firms and society benefit from. Hence public intervention is reasoned by externalities. For the firm, public venture capital means the cooperation with a special kind of investor. On the one hand, managers are often government employees or civil servants with different incentive structures, hence having neither the expertise nor the motivation to select and support the venture. On the other hand, public venture capital funds are supposed to forego extreme return targets for their policy objectives (Leleux & Surlemont 2003, p.81; Lerner 2002, p. F78).

	Informal Venture Capital			Formal Venture Capital		
	Family, Friends & Fools	Business Angel	Crowd Funding	Independent VC	Corporate VC	Public VC
<b>Level of Control</b>	Low	Moderate	Low – moderate	High	High	Moderate – high
<b>Amount of Investment</b>	Small	Moderate	Small – moderate	Large	Large	Large
<b>Financial vs. Strategic Targets</b>	Balanced	Balanced	Financial	Financial	Strategic	Balanced
<b>Relevant Expertise</b>	No	High	No	Moderate – high	High	Low – moderate
<b>Relevant Networks</b>	None	Substantial	None	Moderate – substantial	Substantial	Low – moderate

Figure 36: Characteristics of Venture Capital Investors

As mentioned, the different sources of venture capital come along with different implications on the venture. Therefore, the type of venture capital involved may be very critical to venture success and has to be tracked for analysis. The main implications of the diverse sources of venture capital are summarized in Figure 36.

In addition to the source of the equity capital, the amount of equity capital raised, respectively the amount of capital planned to be raised is tracked (see Figure 37). This information serves descriptive statistics to draw comparisons

between different universities, sectors or other characteristics of the ventures. Furthermore, the amount of venture capital the venture was able to raise is an important indicator for the potential and the size of the venture. The change over time may reveal interesting observations, as well as the information if the amount planned could really be achieved.

Please state the amount of equity capital your company has raised. If no venture capital has been raised yet, but it is planned to raise some, please state the amount of the planned sum. (in Euro)			
<input type="radio"/> 0	<input type="radio"/> > 0 - 25.000	<input type="radio"/> > 25.000 - 50.000	<input type="radio"/> > 50.000 - 250.000
<input type="radio"/> > 250.000 - 2.000.000	<input type="radio"/> > 2.000.000 - 10.000.000	<input type="radio"/> > 10.000.000	

Figure 37: Finance 4

Did you or your company receive public funding for the foundation?	
<input type="radio"/> Yes	<input type="radio"/> No

Figure 38: Finance 5

The next question is independent from the acquisition of venture capital and deals with public funding besides equity capital (see Figure 38). Public funding plays a vital role within the area of spin-offs and aims to support ventures in their spin-off process. This happens in terms of money (no equity capital, mainly labor costs) and professional support like feasibility studies, development of prototypes and similar (Kulicke *et al.* 2006, p. 35; Hermann von Helmholtz-Gemeinschaft Deutscher Forschungszentren e.V. 2010, p. 12).

If public funding has been received, the subsequent question asks about the source of this funding (see Figure 39). According to the parent organization of the spin-off there are different possibilities for the venture to gain public funding.

Across all institutions, there is the nationwide EXIST-program, initiated by the German Federal Ministry of Economics and Technology and co-financed by the European Social Fund. Additionally, there are regional funding programs and special programs initiated by the four big research societies in Germany, Fraunhofer-Gesellschaft, Helmholtz Association, Max Planck Society and Leibniz Association which apply for spin-offs from the corresponding parent.

Please state which kind of public funding (without equity capital) you or your company received.

<input type="checkbox"/> EXIST Programs	<input type="checkbox"/> Non-Academic Support Programs
<input type="checkbox"/> EXIST-Gründerstipendium	<input type="checkbox"/> Fraunhofer Programs
<input type="checkbox"/> EXIST-Forschungstransfer	<input type="checkbox"/> Fraunhofer FFE
<input type="checkbox"/> EXIST-Seed	<input type="checkbox"/> Fraunhofer FFM
<input type="checkbox"/> KfW Programs	<input type="checkbox"/> Helmholtz Programs
<input type="checkbox"/> KfW-Gründercoaching	<input type="checkbox"/> Helmholtz-Validierungsfonds
<input type="checkbox"/> KfW-Gründerkredit	<input type="checkbox"/> Helmholtz Enterprise
<input type="checkbox"/> Regional and other support programs	<input type="checkbox"/> Helmholtz Enterprise Fonds plus
<input type="checkbox"/> GO-Bio	<input type="checkbox"/> Programs of the Max Planck Society
<input type="checkbox"/> Other	<input type="checkbox"/> Programs of the Leibniz Association
<input type="text"/>	<input type="checkbox"/> Other
	<input type="text"/>

Figure 39: Finance 6

### 3.1.5 Founding Team

Section five of the questionnaire deals with the issue of the founding team. The composition of the founding team has been identified as an important factor by various studies (for an overview see Helm & Mauroner 2007, pp. 247). Therefore this section is dealing with the founding teams regarding gender, educational level, field of study, experience in different areas and similar.

Please provide information about the members of your founding team.

● Number of team members in total	<input type="text"/>
● Number of female team members	<input type="text"/>
● Number of team members with a university degree	<input type="text"/>
● in the STEM fields (science, technology, engineering and mathematics)	<input type="text"/>
● in economic and social sciences	<input type="text"/>
● in law	<input type="text"/>
● in other subjects	<input type="text"/>
● Number of team members with connections to the KIT	<input type="text"/>

Figure 40: Founding Team 1

The first question within this section asks about the composition of the founding team in terms of total number of founders, gender, educational level and field of study (see Figure 40). Although there is a similarity to the question of Figure 25

(section three), both questions denote different meanings. While the question above asks about the department the venture derives from, this question deals with the fields of study the founders have taken.

The average size of founding teams lies between two and three. Only one third of the ventures investigated by Kulicke & Görisch (2002) were founded by only one person. 41.3 % of the founding teams consisted of two persons, 25.5 % of three to five founders and 3.4 % of more than five. Regarding the success, ventures founded by a team employ highly significantly more people than ones founded by single persons (Kulicke & Görisch 2002, pp. 23).

In Berlin, 34 % of the ventures are founded by one single person, in 28 % of the foundations it is a team of two people and the remaining 38 % of the ventures are founded by three or more people with very few teams bigger than five people (Matuschka & Fajga 2011, p. 42).

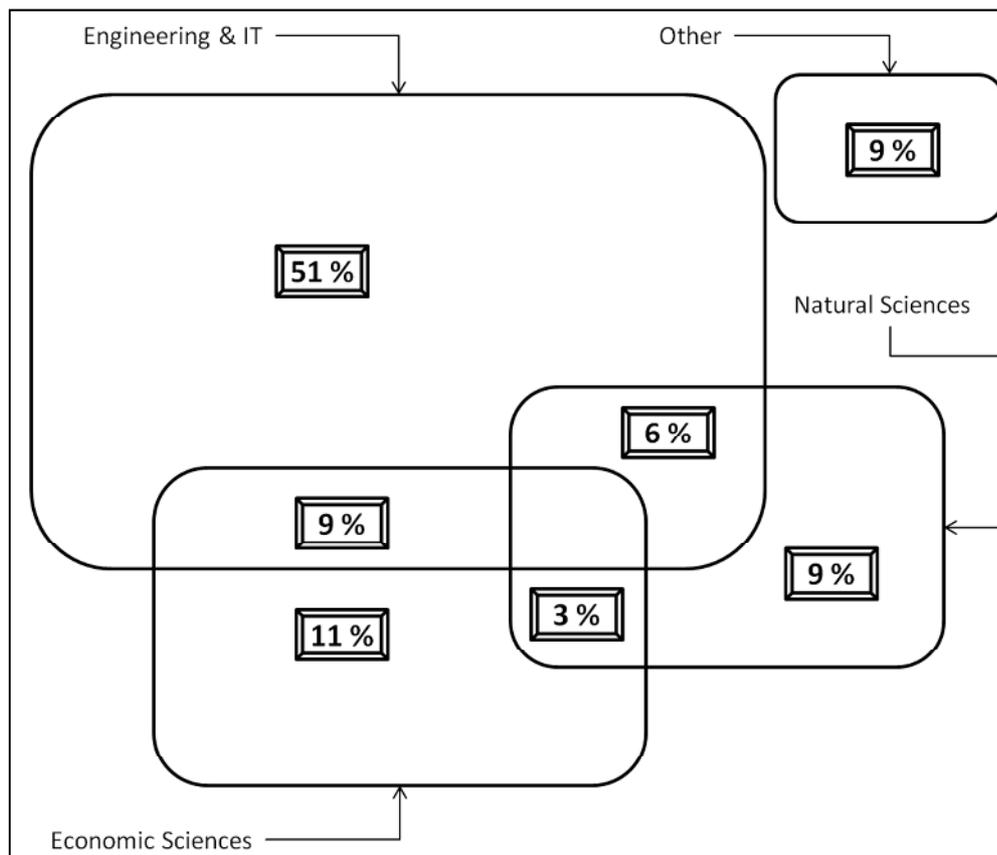


Figure 41: Team Compositions regarding the Field of Study (Kulicke & Görisch 2002, fig. 18)

According to Rasmussen *et al.* (2011), high-technology ventures are often developed by teams because one individual person is unlikely to possess all competencies necessary to gain the credibility with potential investors and partners that is needed to access and acquire necessary key resources like capital and personnel (p. 1318).

The compositions of founding teams regarding the field of study are illustrated in Figure 41. More than half of the founding teams include only members from engineering or informatics. Foundations only with members either out of economics (11 %), the natural sciences (9 %) or other subjects (5 %) are quite rare (Kulicke & Görisch 2002, p. 38; see Figure 41).

Please provide information about the practical experience available within your founding team.	Extensively			Not at all	
	++	+	0	-	--
● Professional experience (outside the science sector)	<input type="radio"/>				
● Experience with start-ups	<input type="radio"/>				
● Management experience	<input type="radio"/>				
● Project experience	<input type="radio"/>				
● Experience in research and development	<input type="radio"/>				

Figure 42: Founding Team 2

The following question deals with the issue of the founders' experience (see Figure 42). This question is an absolutely subjective one. The founder is asked to rate the skills of the founding team regarding different aspects from professional experience over experience with ventures to experience in R&D.

Shane & Stuart (2002) assume that there is a positive connection between previous industry experience and venture success, since knowledge of strategies and customers, and contacts to suppliers and customers may be very beneficial (p. 161; see also Kulicke & Görisch 2002, p. 39). Furthermore, experience with previous start-ups is also very likely to be an advantage since know-how in leading an early-stage organization, developing new products and bringing them to market, and managing relationships with stakeholders can be very helpful (Shane & Stuart 2002, p. 161).

Various other studies have also found correlations between founders' experience and venture success. Especially professional experience and the related embeddedness in industrial networks are important but spin-off founders usually have technological rather than commercial experience. Strong relationships have been found between unspecific professional experience, such as expertise in project management, and entrepreneurial engagement. Also founders with experience in project management are found to be more successful (Helm & Mauroner 2007, p. 250).

Since venture capitalists use the professional experience of the founding team as one important criterion for their investment decision, especially research-based spin-offs have been denied funding because they often lack business experience (Clarysse & Moray 2004, p. 55).

Please state the total share all founders owned						
... at the time of <u>foundation</u> :						
<input type="radio"/> 0 %	<input type="radio"/> 1 - 5 %	<input type="radio"/> 6 - 25 %	<input type="radio"/> 26 - 50 %	<input type="radio"/> 51 - 75 %	<input type="radio"/> 76 - 99 %	<input type="radio"/> 100 %
... at the end of the <u>last fiscal year</u> :						
<input type="radio"/> 0 %	<input type="radio"/> 1 - 5 %	<input type="radio"/> 6 - 25 %	<input type="radio"/> 26 - 50 %	<input type="radio"/> 51 - 75 %	<input type="radio"/> 76 - 99 %	<input type="radio"/> 100 %

Figure 43: Founding Team 3 & 4

The next two questions are about the shareholder situation of the founders (see Figure 43). Respondents are asked to state the total share of the venture owned by the initial founders for the time of foundation and for the end of the last fiscal year. Within the longitudinal study, the development of this share can be tracked.

Bruno & Tyebjee (1985) found that most of entrepreneurs do not relinquish more than 50 % of the shares and hence do not give away the control majority. On average, 35.8 % of the equity has been relinquished. Therefore the authors conclude that concerns over high cost of venture capital in terms of equity capital is not supported, the typical founders hold a substantial equity position even after several rounds of financing (pp. 66).

Data from Berlin show that three fourths of the ventures are owned by the founders to 100 %. Only 11 % of the ventures are firms where the founders do not own a majority (Matuschka & Fajga 2011, p. 32).

Is one or are more persons employed in the company's management who are not part of the founding team and if so, where and since when?

General Management, since fiscal year number:

Research & Development, since fiscal year number:

Marketing and Sales, since fiscal year number:

Finance, since fiscal year number:

Business Development, since fiscal year number:

Other, namely , since fiscal year number:

No external members within the management team.

Figure 44: Founding Team 5

The final question of section five asks about managers who were not part of the founding team (see Figure 44). This issue addresses the completeness of skills present in the management team and its composition.

Researchers or graduates from university are assumed to lack managerial competences. As already mentioned, research-based spin-offs are often denied funding due to the issue that the founding team usually consists merely of the inventors who may focus too much on the technical aspects of the innovation. One approach is to hire experienced CEOs for the management team of the venture (Vohora *et al.* 2004, p. 148).

However, adding new team members should not happen too early. Within the early phase of the venture the main task is a further development of the technology. This is why the CEO must be able to understand the technology and to develop the business himself. Additionally the CEO has to be accepted by the founding team which is a critical point, since researches very often are not willing to give away the control over their own idea. An external CEO might be more appropriate when first revenues are coming and the venture is growing faster (Clarysse & Moray 2004, pp. 55).

### 3.1.6 Business Concept and Technology

The sixth section of the questionnaire deals with the business concept and the technology underpinning the venture. The section asks about the opportunity, the way to market and underlying patents. Of course these issues are of prime importance to characterize the ventures but may also reveal interesting correlations to venture success.

<p>On what basis has your business concept been developed?</p> <ul style="list-style-type: none"><li><input type="radio"/> An identified product or service idea was developed further into a business model.</li><li><input type="radio"/> It was a conscious and deliberate sought for a business opportunity, which then has been realized.</li></ul>
--

Figure 45: Business Concept and Technology 1

The first question asks about the process of opportunity recognition or opportunity creation (see Figure 45). Essentially there are two ways of getting to the idea of founding a company. Either through the identification of an opportunity and further development to a business model or through the conscious and deliberate sought for a business idea when one has decided to found a company on one's own.

These two main possibilities derive from all eight possible processes developed and investigated by various studies. New ventures hence may result from:

- Opportunity development, where an idea is recognized and developed further,
- Opportunity scanning or alertness, where the entrepreneur is attentively looking for a suitable opportunity,
- Opportunity matching, where supply and demand are consciously compared and an opportunity is identified,
- Need perception, where a need is felt and its satisfaction results in an opportunity,
- Opportunity creating, where an opportunity is creatively worked out,
- Problem solving, where an opportunity derives from the solution of a discovered problem,

- Business possibilities, where an opportunity is based and developed on business mechanisms, and finally
- Social construction, where the opportunity arises through social interactions over time (Hansen *et al.* 2009, table 5).

The different ways to get to a business concept for a new venture differ essentially in the process itself as well as in the approach of the entrepreneur, his starting conditions and his motivation. These fundamental differences may result in different venture development processes which can be interesting to investigate.

Please select all steps on the way to your product's or service's market entry that have already been fulfilled at the time of your company's foundation.

<input type="checkbox"/> Conceptual idea developed	<input type="checkbox"/> Prototype/beta test available
<input type="checkbox"/> Ready for the market	<input type="checkbox"/> First customers acquired

Figure 46: Business Concept and Technology 2

The second question is about market readiness of the product or service at the time of foundation (see Figure 46). Which steps on the way to market readiness have already been taken prior to the foundation is likely to differ significantly between exploitation and competence spin-offs and may also have an influence on time to market, first fiscal year with operating profits and venture success.

The more of the denoted steps have already been taken the lower the risk of a product failure is since all steps are critical and bear the risk to reveal the necessity to invest in further development or possibly even infeasibility.

How timely far is or has your product or service been from market entry at the time of your company's foundation?

<input type="radio"/> Immediate market entry	<input type="radio"/> Less than 1 year
<input type="radio"/> 1 to 2 years	<input type="radio"/> 2 to 4 years
<input type="radio"/> More than 4 years	

Figure 47: Business Concept and Technology 3

The subsequent question asks for the time to market from company foundation (see Figure 47). This question is obviously linked with the previous question and also aims to indicate the risk involved.

The time to market is very critical since within this time period further resources are needed to finish development. As well there are opportunity costs in form of missed revenues while the product still is not on market. However, for different industry sectors there appear different times to market. In the biotechnology sector for example there may pass ten years or more of development and patenting until the product is brought to market (Frei 2006, p. 102).

Did any patents underly your company's foundation?

Yes  No

Please state for each of the following kind-of-use if and if applicable how many patents have been used this way.

<ul style="list-style-type: none"> <li><input type="radio"/> Purchase of patents <input style="width: 80px;" type="text"/></li> <li><input type="radio"/> Use of own patents <input style="width: 80px;" type="text"/></li> </ul>	<ul style="list-style-type: none"> <li><input type="radio"/> Use of licenses <input style="width: 80px;" type="text"/></li> <li><input type="radio"/> Other <input style="width: 80px;" type="text"/></li> </ul>
---	--

Figure 48: Business Concept and Technology 4 & 5

The last two questions of section six are about patents which underpin the venture (see Figure 48). The fact that a business concept is based on a patented invention may have strong influence on the development of the venture.

The exploitation of patents by spin-offs is one important form of technology transfer and hence deserves closer attention in research. With patents underlying the venture's business concept, different studies proved a positive effect on funding abilities and venture's growth (Helm & Mauroner 2007, p. 257).

Statistically, especially exploitation spin-offs that exploit research results are supposed to be more likely based on patents (5 %) than competence spin-offs (1 %) or other start-ups (Kulicke & Görisch 2002, p.31; Egelin *et al.* 2002, p. 41). As illustrated in Figure 49, a big difference in the frequency of using patents is found between spin-offs from public research institutions (20 %) and spin-offs from universities (1.7 %). This substantial difference relates to the fact that spin-offs from universities are to a large extent founded by graduates without prior

research activity. Overall, 6 to 12 % of the patents from German universities and public research institutions are commercialized through spin-off activities (Egelin *et al.* 2002, pp. 40).

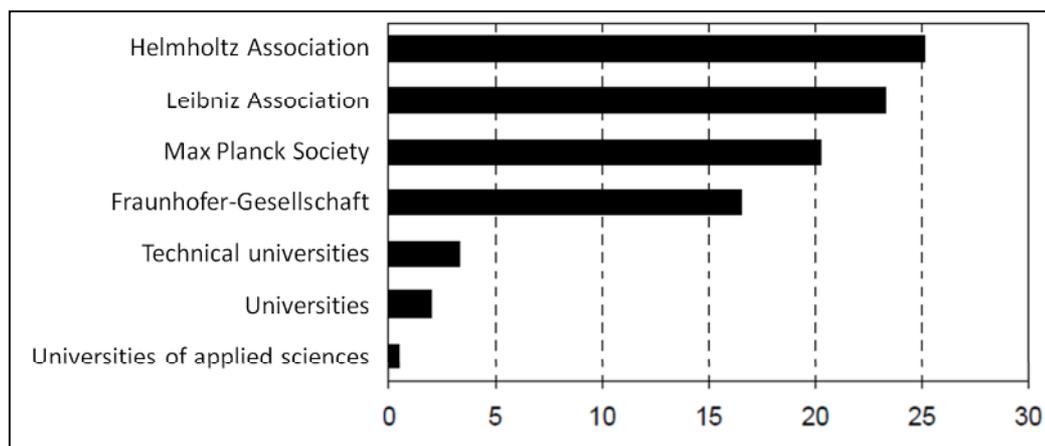


Figure 49: Share of spin-offs using patents (Egelin *et al.* 2002, fig. 36)

The second of these two questions asks about the form of patent usage. This issue may reveal interesting connections with venture development since the nature of rights of use may be of importance. Furthermore the development over time is of interest, since some licensing contracts contain an option to purchase.

In Berlin, 11 % of the ventures make use of patents. Almost 75 % of these firms exploit own patents, 30 % make use of patents by licensing and 14 % buy patents (Matuschka & Fajga 2011, pp. 71)

### 3.1.7 Market and Competition

The last section of the questionnaire is about market and competition. The prime importance of Marketing for new ventures has already been emphasized in paragraph 2.2.4. Hence the issues of number of competitors, chief market, market strategy and pricing strategy are tracked within this section.

First, the number of competitors is recorded for the time of venture foundation and for the time of the survey (see Figure 50). Through recording former and actual number of competitors and through the longitudinal design, the market development is tracked as well.

How many companies have offered a substitute for at least one of your products or services, hence were direct competitors?

... at the time of foundation:

0                       1                       2                       3-5                       >5

... at present:

0                       1                       2                       3-5                       >5

Figure 50: Market and Competition 1 & 2

The issue of the intensity of competition is underpinning this question. Since this intensity is difficult to measure, the number of competitors is used as an indicator, with competitor defined as company which offers a substitute for at least one of the venture's products or services. This definition seems to be appropriate since technology-based ventures usually offer a product or a service that has not been on market so far. Nevertheless, ventures have to compete with other firms that offer a substitute for the venture's product or service which fulfills the same need in another way and/or for another price. Hence the intensity of competition a venture is facing can be indicated through the number of companies offering a substitute (Frei 2006, p. 81).

Table 6: Porter's seven barriers to entry (Porter 2008, pp. 26)

1) Economies of scale	3) Capital requirements	5) Access to distribution channels	7) Government policy
2) Product differentiation	4) Switching cost	6) Other cost disadvantages	

The intensity of competition is one important aspect in new venture creation. When looking at Porter's seven major sources of barriers of entry (see Table 6), four of them only occur if there is at least one substitute already on market. If a venture offers a product or service that satisfies a need that cannot be satisfied by a competitor, then the venture does not have to deal with lower costs of competitors through economies of scale, with an increased willingness to pay for a widespread product through demand-side economies of scale, with the problem of customer's switching costs or with barriers through restrictive government policy giving one single firm an advantage (Porter 2008, pp. 26).

Which market is the most important one to your company as measured by the share of turnover?

Local (< 20 km)                       Regional (< 50 km)

National                                       International

Figure 51: Market and Competition 3

The following question asks about the chief market (see Figure 51) in terms of the location and is primarily of descriptive relevance. Nevertheless, also relationships to venture success may be revealed.

Spin-offs from TUB name national (41 %) and international (32 %) markets most important. Local (9 %) and regional (18 %) markets are of minor importance (Matuschka & Fajga 2011, p. 37).

This criterion is likely to also have an influence on venture success. Different means of marketing and distribution have to be used if a firm addresses national or even international customers. Also the time of focusing on larger markets can be tracked by a longitudinal study and may be used as an indicator for growth rate.

Please select the option which best describes your market strategy.

Price leadership                               Quality leadership

Innovation leadership

Figure 52: Market and Competition 4

The fourth question of this last section is about marketing strategy (see Figure 52) and linked with the concept of the Unique Selling Proposition (USP). The USP gives customers a reason to prefer the product to another (Frei 2006, p. 96). It can essentially be based on the lowest price, the best quality or the greatest innovation.

Research-based spin-offs are likely to pursue an innovation leadership. But price or quality leaderships are possible, as well if the technology underpinning the venture is for example a new production method that allows higher cost efficiencies or higher quality standards.

On what basis has the first price of your product or service been set?

On basis of production costs

On basis of the competitors

On basis of the willingness to pay/customer benefit

Figure 53: Market and Competition 5

Finally, the last question asks about pricing (see Figure 53). There are three main possibilities to find a price for a new product or service from taking the production costs as the basis over pricing by a look at the competitors to detecting the customers' willingness to pay.

Finding the right price for their products or services is essential for new ventures since the price is the only element in marketing which produces revenues and hence determines the whole amount of money a firm earns. Additionally, the price of a product or service is a clear signal to the set of potential customers: positioning the product as innovative or high quality enables but also forces the firm to charge a premium price. Customers expect high-quality or innovative products to be costly. If they aren't, the customer is likely to be suspicious of the company's promises. On the other hand, competing with other firms offering substitutes to one's own product or service, the firm has to offer the product or service for a lower price if it fulfills the same needs (Barringer & Ireland 2012, pp. 394; Volkmann & Tokarski 2007, pp. 240).

### 3.2 Overview

Table 7 gives an overview of the 45 questions regarding different characteristics. Questions that can be answered by objective (Obj) observations are likely to cause fewer problems regarding reliability and validity (see paragraph 2.1.4) than questions asking for subjective (Subj) estimations or opinions. Questions dealing with issues regarding the founding process or the time of foundation have to be answered only once (Once) since they are dealing with the past, whereby questions dealing with the actual situation of the venture have to be answered continuously (Cont).

Table 7: Overview

Question	Obj	Subj	Once	Cont	
Contact Information 1	X			X	
Contact Information 2	X			X	
Contact Information 3	X			X	
Contact Information 4	X			X	
Contact Information 5	X			X	
General Information 1	X		X		
General Information 2	X			X	
General Information 3	X		X		
General Information 4	X			X	
General Information 5	X			X	
General Information 6	X			X	
General Information 7	X		X		
General Information 8	X			X	
General Information 9	X			X	
General Information 10	X		X		
General Information 11	X			X	
General Information 12	X			X	
Connections to University 1		X	X		
Connections to University 2	X		X		
Connections to University 3	X			X	
Connections to University 4	X		X		
Connections to University 5		X	X		
Connections to University 6	X			X	
Connections to University 7	X			X	
Finance 1	X			X	
Finance 2	X			X	
Finance 3	X			X	
Finance 4		X		X	
Finance 5	X		X		
Finance 6	X		X		
Founding Team 1	X		X		
Founding Team 2		X	X		
Founding Team 3	X		X		
Founding Team 4	X			X	
Founding Team 5	X			X	
Business Concept and Technology 1		X	X		
Business Concept and Technology 2	X		X		
Business Concept and Technology 3		X		X	
Business Concept and Technology 4	X		X		
Business Concept and Technology 5	X		X		
Market and Competition 1		X	X		
Market and Competition 2		X		X	
Market and Competition 3	X			X	
Market and Competition 4		X		X	
Market and Competition 5		X	X		
<b>Sum</b>	<b>35</b>	<b>2</b>	<b>8</b>	<b>19</b>	<b>26</b>

### 3.3 Pretests

After identification and selection of the relevant questions, the questionnaire has been tested regarding understandability of the verbalizations and time effort for completion.

The respondents have been visited and a very short verbal introduction in the background of the project was given, similar to how it would happen in the cover letter of the later survey. Then the participants filled out the questionnaire independently without any assistance. The time for completion has been recorded and questions where the respondent seemed to hesitate have been noted. After completion, the respondents were asked for feedback and every question has been discussed to investigate whether it was understood correctly. Especially the questions where the respondent seemed to hesitate were checked and the respondent was asked about the reason for his uncertainty in answering the regarding question.

Table 8: Pretests

	<b>Firm A</b>	<b>Firm B</b>	<b>Firm C</b>	<b>Firm D</b>
<b>Year of Legal Foundation</b>	2008	2011	2010	2011
<b>Kind of Spin-Off</b>	Competence Spin-Off	Exploitation Spin-Off	Competence Spin-Off	Competence Spin-Off
<b>Number of Employees</b>	6 - 20	1 - 5	1 - 5	6 - 20
<b>Industry Sector</b>	IT/Internet/ Web 2.0	Biotechnology	IT/Internet/ Web 2.0	Construction/ Architecture/ Planning
<b>Time Expenditure for Completion</b>	8' 46''	8' 55''	10' 50''	13' 50''

Four firms participated in these pretests (see Table 8): One exploitation spin-off and three competence spin-offs. The average time needed was 10 minutes and 35 seconds, with a standard deviation of 2.36 minutes and is hence within an area of acceptable effort. Questions with ambiguous verbalizations have been

reformulated from respondent to respondent and led to the questionnaire stated previously.

### 3.4 Implementation

The questionnaire is implemented as an online survey. Questions depending on the answer of a previous question will only be displayed if the previous answer fulfills the specific filter condition. Thus the questionnaire can be shortened and the time needed for completion can be reduced. A further reduction of questionnaire length is achieved through the elimination of the 19 one-time-questions (summary Table 7, “Once”) in the questionnaire for firms not taking part the first time. For these firms, the questions recorded continuously should have the answer given the last time as starting value. This should be very comfortable for the respondents and further increase response rate. Thus after the first completion (about 10 minutes according to the pretests) a following completion should take less than 6 minutes.

The questionnaire will be implemented by the Karlsruhe Institute of Technology and the Technische Universität München in the beginning of 2013. The Technische Universität Berlin will join in the end of 2014. From then, the survey will be repeated every two years. This frequency is a trade-off between degree of accuracy in tracking the timely development and the effort for firms taking part in the study. Further universities are very welcome to join the Harmonized Instrument Initiative and hence enrich the broad research project in academic entrepreneurship from German universities.

## 4. Further Aspects

Although the questionnaire deals with the main subjects of entrepreneurship research and especially research in academic entrepreneurship, there are several issues that could not have been integrated in the survey but are of interest for tracking the development process. Hence this chapter gives an overview of further issues that might be investigated by further studies of subsets of the resulting database.

### 4.1 General Information

From question Contact Information 2 (see Figure 10) the distance from university can be derived. A further possibility would be to ask for the reasons for the choice of office location. Different aspects have already been mentioned in the respective paragraph 3.1.1 (high quality of life, suitable infrastructure, attraction for external capital, vicinity to other research key players, easier knowledge transfer, nearness to business partners, local and regional markets, capital availability, political factors and international experience of the founding team). To ask for a ranking of the relevance of these different aspects might also be interesting.

### 4.2 Connections to University

Some questions deal with the aspects of technology transfer from, founding support of and ongoing contacts to university. Another interesting point is the question of the importance of different skills and knowledge acquired at university (special skills, new scientific methods and techniques, research findings) (Egeln *et al.* 2002, p. 6). Asking the founders to rank the relevance for the foundation might give more information about the role the university is playing within venture creation.

Another interesting question might be whether the focus of the venture has been the research focus of at least one of the members of the founding team. It might be informative to see whether a common focus has influence on venture success – maybe through experience or contacts with suppliers, competitors or customers – or not.

### 4.3 Finance

The questions about finance deal with venture capital financing and public funding. But there is also the possibility of loan capital financing. Although this form of financing is of minor importance since ventures are likely to lack the necessary credit enhancement, it would be interesting whether loan capital financing has influence on or shows correlations with venture success. Using private assets as credit enhancement for the firm's credit may indicate a special founder's believe in venture success. Interest expenses might have negative effects in the first year, especially because the first years of existence are characterized by no to low revenues.

Another interesting point addresses firms financed by CVCs. In the discussion of question Finance 3 (see Figure 34) the special characteristics of corporate venture capitalists have already been mentioned. Hence it would be interesting to know which kinds of connections exist between the venture and the investor. The investor might be customer or supplier. He might do R&D on behalf of the venture or joint R&D might be done. Moreover, the venture might use marketing and distribution resources of the investor (Ivanov & Xie 2010, p. 137). Recording this information, the role of the venture capitalist could be examined and correlations to venture success might reveal. Since these aspects only apply on a quite small subset of the sample, this information may also be tracked in a subsequent survey which includes only companies financed by CVCs.

The investment in high-growth companies happens in financing rounds. More information about these rounds would be interesting (time of financing rounds, time for capital acquisition for each round, kinds of investors involved). Empirical results show that the search for venture capital normally takes 6 to 7 months. The first round of financing usually takes much longer (68 %) than other rounds (Bruno & Tyebjee 1985, pp. 65).

An important issue of financing a venture is getting in touch with potential investors. Therefore it might be interesting whether there has already been a direct or indirect contact between one of the venture's founders and a potential

investor or not (Shane & Scott 2002, pp. 160). Empirical results show that direct and indirect contacts to an investor have a significant influence on venture failure. With an existing direct tie, failure rate is 70 % lower than without such a relationship (ibid, pp. 163).

#### 4.4 Founding Team

The questions about the founding team included within the questionnaire deal mainly with the characteristics of the team and its members. But also the motivation of the founders to start a business can be very informative. Typical reasons for starting up a venture are the will to work self-determined and independently, to improve income expectations, to fulfill specific needs for products or services, to exploit the economic potential of research findings or to pursue better career opportunities than scientific careers (Egeln *et al.* 2002, p. 45).

On the other hand, there are also some obstacles that have to be managed. Hence it would be interesting to ask for the meaning of different problems within the foundation process. Common problems are lacking sources of finance, lacking qualified personnel, approval procedures and laws, insufficient economical knowledge, insufficient market knowledge, insufficient technological information, conflicts with the scientific career and lacking acceptance by the colleagues (Egeln *et al.* 2002, p. 46).

#### 4.5 Business Concept and Technology

Technology-based ventures bring innovative products or services to the market. Hence it would be interesting to determine the degree and kind of innovation. The product or service might be a proven combination of existing technologies, a new combination of existing technologies, might be based on a new technology developed elsewhere or might be based on a new technology developed specifically for this product or service by the company (Burgel & Murray 2000, p. 57). Recording this issue helps to better characterize the venture and its business concept and may correlate with other areas like R&D or marketing activity.

Ventures based on new research findings show a significantly higher involvement in research and development. Almost 60 % of the exploitation spin-offs, about 40 % of competence spin-offs, more than 30 % of academic start-ups and less than 20 % of non-academic start-ups do own R&D (Egeln *et al.* 2002, p. 37). This is likely to result in different proportions of people employed in R&D and tracking this proportion might be informative. Especially companies following the strategy of innovation leadership (question Market and Competition 4, Figure 52) should show a higher R&D activity.

Although the questions Business Concept and Technology 4 and 5 already deal with patents underlying the firm's foundation, there are some other aspects that could be recorded. How important have the underlying patents been for venture success? Although a patent might seem very important, ventures might develop in another direction so that the initial patent loses importance. In Berlin, 43 % of the firms making use of patents state a very high, 23 % a high, 31 % a medium and 3 % a low importance of the patents for venture success (Matuschka & Fajga 2011, p. 72). To which extent could the key know-how be protected through patents and when does the first of your most important patents expire (Frei 2006, pp. 93)? Even if patents underpin the firm's foundation, key know-how might not be protected by these patents or the validity of the patents might expire soon. This might have an influence on the possibility of fully exploiting the patents and hence finally regard venture success.

#### 4.6 Market and Competition

A very interesting issue in the field of marketing strategy is pricing. One question of the questionnaire deals with the method of setting the first price (Market and Competition 5, Figure 53). But it remains unclear which pricing strategy is employed. Volkmann & Tokarski (2007) differ between four basic strategies: high-price strategy, phasing-out strategy, low-price strategy and penetration strategy. A high-price strategy can be used, if there is an essential competitive advantage or an advance in technology. The introductory price is high and no significant price reduction is done. Hence the firm signals high quality. Following a phasing-out strategy, the introductory price is high as well,

but the price is then reduced after a certain time when new substitutes are on the market for example. Thereby the unique position in the market is used for generating profits. The price reduction may also derive from the learning curve. The low-price strategy very often aims for a cost leadership. The introductory price is low and the price remains more or less constant. This strategy may be beneficial in very competitive markets and similar products. Although this strategy is a special challenge for new firms with normally few resources, it sometimes is nevertheless successful when the whole business concept is designed for cost leadership. The penetration strategy also starts with a low introductory price to gain high market shares with a low or even negative margin. Competitors shall be forced out of market to raise the price later on. This strategy is very cost intensive since the margin is low, the level of competition is high and there may be high costs for communication like advertising (pp. 237). Information about the pricing strategy might be very interesting to characterize the venture and reveal remarkable correlations to other characteristics and finally venture success.

Although question Market and Competition 4 (Figure 52) already deals with the main market strategy, a more detailed positioning might be interesting. Therefore a subjective rating of the meaning of the different factors low price, high quality, greatest innovation and best service may lead to a better understanding how the founders see their product or service and its USP (see also the discussion to question Market and Competition 4 and Frei 2006, p. 96). Having a clear idea of the product's or service's competitive advantage is essential for marketing and hence for venture success.

Furthermore, it might be interesting to characterize the product or service in terms of customer-specific adjustments and transaction cost. Customer-specific adjustments might be low or substantial or absolutely not necessary. Probable transaction cost may arise through technical consultation prior to sales, complex or time-consuming installation, regular maintenance and/ or upgrades, or specialized training required for front line and sales personnel (Burgel & Murray 2000, p. 57). It also might be interesting to ask for the compatibility of the new

product or service to the product or service used by the customer previously and hence track the switching costs: Do the customers have to make no, minor or major changes in their current practices (Robinson 1990, p. 1283)? These characteristics are likely to have an influence on the venture's development since with high adjustments and transaction cost or major changes in business practice, a higher customer loyalty and lower intensity of competition are probable.

Questions Market and Competition 1 and 2 (Figure 50) ask for the number of competitors to measure the intensity of competition. To further record the competitive situation of the company it would also be very informative to ask about the breadth of the own product line in relation to the competitors' product portfolios (Robinson 1990, p. 1283). This information can also serve as a measurement of the market presence over time since the firm is likely to increase its product line breadth with its own growth.

Further information about the position within the market environment might be an estimation of the yearly marketing spending in relation to the competitors' marketing spending or the ranking of the own price level in comparison to the prices of the main competing products (ibid). Thereby the market position of the venture can be tracked more precisely and the consistency with market strategy can be checked.

New ventures have to find their own way to get in touch with potential customers. They are facing the challenge to reach their target groups without exceeding their relatively small marketing budgets. Therefore they are likely to start with lower-cost communication channels instead of classical advertising in mass media. So it would be interesting to track the means of communication the venture is employing. Diverse categories are classical advertising (impersonal delivery of advertising messages), advertising through social media (like facebook, twitter, blogging and others), guerilla marketing (creative use of marketing resources in order to achieve a surprise effect), personal sale (direct information of the customers without intermediate station), exhibitions and conferences (presentation focused on the specific target groups) and public

relations (positioning within the editorial part of newspapers, magazines, radio and TV – no commercials) (Barringer & Ireland 2012, pp. 391; Blundel & Lockett 2011, pp. 113; Volkmann & Tokarski 2007, pp. 242). Tracking the use of this communication instruments and their subjective meaning for the firm's management might serve as a possibility to track the development of the marketing activities and also reveal correlations to venture success.

As ventures face special challenges regarding the communication channels, they are likely to face special challenges regarding the distribution channels as well. Hence it would be informative to ask about the kind of distribution, i.e. selling the products or services directly to the customers and/or using intermediaries (Barringer & Ireland 2012, pp. 403; Volkmann & Tokarski 2007, pp. 248). Asking the respondent to state the shares of the total return to these channels would allow tracking the development of the distribution processes within the growing company.

Carson (1993) developed a four-stage model of the evolutionary process of small business marketing. In the initial marketing stage, there is minimal selling activity and almost no promotional support. Most customers are known personally and sale happens through personal interaction, with either the firm contacting the customer or the customer making a request personally. The second stage is called "reactive selling" and is characterized by an increasing number of customers and the firm providing more formal information on its product or service, prices and selling conditions. The third stage is the "DIY (do it yourself) marketing approach" with the managers recognizing the growing importance of marketing and trying to start new marketing activity on their own. The fourth and last stage is called "integrated proactive marketing" and is characterized by a professional marketing approach including short-, medium- and long-term objectives and employing a holistic view on all marketing activities and interactions (pp. 10). Following this four-stage model one has to track the importance of personal contacts for customer acquisition, the existence of formalized product/service and purchase information, the share of customers requesting the products or services in comparison to the share of customers

acquired proactively and the use of external marketing know-how through marketing consulting or a part- or full-time marketing employee. Hence the development of the venture's marketing activities could be recorded in more detail and the four-stage model of Carson (1993) might be verified and integrated into venture life cycle theory.

One critical issue regarding market orientation is the integration of (potential) customers into the development process (Riffelmacher 2006, p. 268). Have (potential) customers been integrated in R&D and if so, in which steps of development? How do you rate their importance? As already mentioned, especially researchers and hence founders of technology-based ventures tend to develop their products or services without sufficiently thinking about market conditions and customer needs, because they lack the necessary business experience. Therefore it can be very important to care about the feedback of (potential) customers and to use this feedback to guide the product or service development and finally influence venture success.

Besides integration of potential customers into the development process, existing customers can also serve as reference for the acquisition of new customers. This possibility is important for new firms since they cannot profit from brand awareness and image. Hence they have to use other ways to win the confidence of potential customers (Barringer & Ireland 2012, p. 394). A possible question might be to ask for a subjective rating of the importance of reference customers for venture success. This rating might then also be integrated into the four-stage model of Carson (1993) introduced above.

In addition to actual marketing activities it might also be very informative to have a closer look on planning and control mechanisms in marketing. According to Boag (1987), marketing planning is divided into strategic and operational planning. These plans consist of goal establishment as well as of guiding policies and tactics for achievement of these goals. One possibility to record this issue would be a rating of how detailed strategic and operational marketing plans exist. Regarding marketing control, Boag (1987) concerns measurement, corrective actions and evaluation and reward. The employment of marketing

performance indicators can be recorded through a rating of the level of detail of the different deviations from planned turnover, average price, product/ service mix, development of distributors, communication or customer satisfaction. Corrective actions can be tracked through a categorization into one of the following classes: no formalized control, formalized control after completion, control eventually during and regularly after completion, control eventually during and regularly after completion plus steering corrections if necessary, regularly control during and after completion, and regularly control during and after completion plus steering corrections if necessary. Finally, the evaluation and reward systems can be classified as systems with only fixed salary, with fixed salary plus bonus depending on revenues, with fixed salary plus bonus depending on the achievement of target agreements, merely with bonus depending on revenues, and merely with bonus depending on the achievement of target agreements (Boag 1987, pp. 367). Tracking these four criteria of planning and control mechanisms would give a good impression of the degree of formalization within the marketing activities, hence allow recording the development process and life cycle and might reveal correlations with venture success.

#### 4.7 Management and Organization

Some management issues have already been regarded in section five of the questionnaire: Founding Team (3.1.5). But a deeper investigation of management behavior and problems as well as the characteristics of the venture's organization could not be done within the ten minutes of the questionnaire. However there are some interesting questions.

What management systems does the company employ? Davila *et al.* (2010) investigated different management systems in high-growth start-ups. The main categories of management systems are financial planning, financial evaluation, human resource planning, human resource evaluation and strategic planning (p. 83). Using a longitudinal research design would be very interesting since the employment of the different systems and subsystems over the venture's development might show very detailed the growing organizational und

managerial structures. However, the authors introduced 46 individual management systems which would be very complex to track.

What problems is the management dealing with at the moment? As already introduced in paragraph 2.2.3, a venture is facing different problems within its development process. Asking the management team to rate different problems regarding their actual meaning would help to determine the stage of growth, the venture is currently in. Kazanjian (1988) asked for a rating of 18 items on a seven-point Likert scale: developing a new product or technology application, securing financial resources and backing, acquiring key outside advisors or board members, product support or customer service, attracting capable personnel, adequate facilities and/ or space, developing a network of reliable vendors and suppliers, produce in volumes adequate to meet demand, meet sales targets, management depth and talent, cost control, definition of organizational roles, responsibilities and policies, management information systems, attaining profitability or market share goals, penetrating new geographic territories, administrative burden and red tape, development of financial systems and internal controls, and establishing a firm position in product/ market segments.

The venture grows and so do the organizational structures. The main challenge in this area is to handle the growth from a couple to fifty or more employees. While five employees can be handled in a very unstructured/ cluster approach the management of fifty or one hundred people requires a formal hierarchy and defined processes (Frei 2006, p. 69). One attempt to measure this issue is to ask for the maximum number of hierarchical levels between the CEO and an employee (Hanks *et al.* 1993, p. 15). Another possibility is to ask for a subjective evaluation of the organizational structure as simple structure, structure by functions or structure by divisions. Processes might be regarded as well: Are there formal guidelines and procedures that guide decisions? Are there formal job descriptions for each position? Is there a formal organizational chart (*ibid*, p. 28)? One main distinction is between organic and mechanistic organizations. One study of Stuart & Abetti (1987) revealed that there is a negative impact of organic organizations on venture success. This is somewhat surprising, since the

characteristics of organic organizations – i.e. simple structure, independence, limited review and control mechanisms, open communication and a high degree of self control in order to free innovators from established patterns – are the typical characteristics of young and innovative high-growth firms (pp. 221). Tracking these organizational characteristics might be informative especially for venture life cycle theory and a further investigation of the negative correlation of organic organizations on venture success found by Stuart & Abetti.

Also advisory boards may be of high importance for the venture's development process. Is there an external advisory board and how important is it for venture success? Which functions does this board fulfill (use of the member's know-how and expertise, use of the member's networks and contacts, independent consulting in management issues and decisions)? Board members that have own experience in starting ventures can be very helpful as they play a role as mentors for the management team (Frei 2006, p. 73). Hence this issue might be of high importance for the venture's development process and success.

#### 4.8 Other

A completely different area of start-up development is the use of alliances and cooperation with other companies. As already mentioned in paragraph 4.3, a CVC may play a vital role in the development of the venture through cooperation. But cooperation is not only limited to investors but may also occur with other firms. Probable advantages may arise through the use of specialized assets, like distribution channels or production capacities, through the use of the partner's reputation or through access to complementary technologies that cannot easily be reproduced (Colombo *et al.* 2006, pp. 1169). There are five distinctive forms of alliances: Outsourcing, cooperation, strategic alliance, joint venture and merger (Stros *et al.* 2002, p. 46, cited by Frei 2006, p. 98). Using alliances is more important when the importance of scale economies is high and loses importance with the venture growing in relation to its competitors. Alliances are the more beneficial to the venture the more capabilities are assembled within the alliance and the higher the bargaining power of the venture is (Gomes-Casseres 1997, p. 42). Although the venture obviously profits from such alliances, there are

certainly services in return and there may also be the threat of neglecting the own development in the areas of cooperation. Hence an investigation of the long-time effects might be very informative.

Another issue is the firm's international activity. Especially for research-based ventures it seems to be important to act internationally. The majority of technology-based start-ups has or pursues international contacts, primarily product export and joint R&D projects and licensing (Helm & Mauroner 2007, p. 258). Question Market and Competition 3 (Figure 51) already asks for the firm's chief market. But there are many more international ties possible, like alliances, subsidiaries, suppliers etc. Within a longitudinal study it would be interesting to track the time when the international activities start and to draw correlations to venture development.

Also questions on the issue of entrepreneurial orientation could not be considered. Entrepreneurial orientation "represents a strategic orientation that describes a firm's organizational autonomy, willingness to take risks, innovativeness, and proactive assertiveness" (Walter *et al.* 2006, p. 542). How is the managers' and employees' attitude towards innovation and their willingness to take risks? Entrepreneurial orientation is found to help academic spin-offs competing aggressively with competitors through offering valuable products or services to their customers that promote long-term commitments (*ibid.*). Thus it is important in developing the firm's strategy and a strong entrepreneurial orientation tends to result in the strategy of quality leadership (Knight 2000, pp. 27). Tracking the development of this entrepreneurial orientation for a growing firm allows tracking changes within an aging company.

## 5. Possibilities and Further Research

<p><input checked="" type="radio"/> General Information</p>	<p><input checked="" type="radio"/> Connections to University</p>	<p><input checked="" type="radio"/> Finance</p>
<ul style="list-style-type: none"> <li><input checked="" type="radio"/> Location</li> <li><input checked="" type="radio"/> Age</li> <li><input checked="" type="radio"/> Existence and continuance</li> <li><input checked="" type="radio"/> Sector</li> <li><input checked="" type="radio"/> Products vs. services</li> <li><input checked="" type="radio"/> B2C vs. B2B</li> <li><input checked="" type="radio"/> Size</li> <li><input checked="" type="radio"/> Operating Profits</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="radio"/> Knowledge transfer</li> <li><input checked="" type="radio"/> Founders from university</li> <li><input checked="" type="radio"/> University as shareholder</li> <li><input checked="" type="radio"/> Related university department</li> <li><input checked="" type="radio"/> Founding support</li> <li><input checked="" type="radio"/> Ongoing contacts</li> <li><input checked="" type="radio"/> Academic employees</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="radio"/> Equity Capital</li> <li><input checked="" type="radio"/> Public Funding</li> <li><input type="radio"/> Loan capital</li> </ul>
<p><input checked="" type="radio"/> Founding Team</p>	<p><input checked="" type="radio"/> Business Concept and Technology</p>	<p><input checked="" type="radio"/> Market and Competition</p>
<ul style="list-style-type: none"> <li><input checked="" type="radio"/> Characteristics</li> <li><input checked="" type="radio"/> Experience</li> <li><input checked="" type="radio"/> Ownership fraction</li> <li><input checked="" type="radio"/> Team extension</li> <li><input type="radio"/> Motivation</li> <li><input type="radio"/> Obstacles</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="radio"/> Opportunity recognition</li> <li><input checked="" type="radio"/> Market readiness</li> <li><input checked="" type="radio"/> Time to market</li> <li><input checked="" type="radio"/> Patents</li> <li><input type="radio"/> Degree and kind of innovation</li> <li><input type="radio"/> R&amp;D activities</li> </ul>	<ul style="list-style-type: none"> <li><input checked="" type="radio"/> Intensity of competition</li> <li><input checked="" type="radio"/> Chief market</li> <li><input checked="" type="radio"/> Market strategy</li> <li><input checked="" type="radio"/> Pricing strategy</li> <li><input type="radio"/> Customer-specific adjustments and transaction costs</li> <li><input type="radio"/> Marketing spending</li> <li><input type="radio"/> Communication</li> <li><input type="radio"/> Distribution</li> <li><input type="radio"/> Marketing model</li> <li><input type="radio"/> Customer integration</li> <li><input type="radio"/> Reference customers</li> <li><input type="radio"/> Planning and control</li> </ul>
<p><input type="radio"/> Management and Organization</p>	<p><input type="radio"/> Others</p>	
<ul style="list-style-type: none"> <li><input type="radio"/> Management systems</li> <li><input type="radio"/> Management problems</li> <li><input type="radio"/> Hierarchy levels</li> <li><input type="radio"/> Formalization of processes</li> <li><input type="radio"/> Organic vs. mechanistic organization</li> <li><input type="radio"/> Advisory Board</li> </ul>	<ul style="list-style-type: none"> <li><input type="radio"/> Alliances</li> <li><input type="radio"/> International activities</li> <li><input type="radio"/> Entrepreneurial orientation</li> </ul>	<p><b>Legend</b></p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Fully covered</li> <li><input checked="" type="radio"/> Mainly covered</li> <li><input checked="" type="radio"/> Partially covered</li> <li><input checked="" type="radio"/> Slightly covered</li> <li><input type="radio"/> Not covered</li> </ul>

Figure 54: Issues covered within the questionnaire

Figure 54 gives a brief overview of the different areas of interest and shows the issues covered by the questionnaire and issues that may be subject of further research. The sections General Information, Connections to University, Finance and Founding Team cover most of the relevant questions within the ten-minute questionnaire and only single issues remain open. The section Business Concept and Technology is covered partly since there are still some questions regarding patents, degree and kind of innovation and R&D activities. The field of market and competition can only be regarded slightly within the questionnaire since this area allows a very detailed investigation due to its outstanding importance for new ventures. The field of management and organization could only be introduced in the Chapter 4, Further Aspects but does also contain some interesting points especially regarding life cycle theory. Some other questions remain open as well.

Although the previous chapter shows the limitations of the ten-minute questionnaire, the 45 questions capture the main areas of venture development with a special focus on the peculiarities of academic spin-offs.

The Harmonized Instrument Initiative allows absolute comparability between the different ecosystems for the very first time. The three initial universities in Berlin, Karlsruhe and Munich will send the same questionnaire to their deriving ventures on a regular two-year basis. Hence a data set of incomparable size will be created which may be analyzed in different ways. Comparisons between the ecosystems might lead to a better characterization and understanding of the surroundings of the universities. The analysis of the supporting activities and the evaluation of the offered services by the ventures can help to optimize these services and to find services that are lacking so far in one or another university.

The longitudinal design and the different questions to several criteria of development will enrich the research in venture life cycle theory. New findings will lead to a better understanding of necessary development steps that have to be taken by the ventures and hence induce a better understanding of how to grow technology-based ventures successfully.

Besides analysis of the data gained through the developed questionnaire, a consequent tracking of the ventures deriving from university generates an invaluable data set for further research in the areas discussed in Chapter 4. Subsets may be chosen and specialized questionnaires to, for example, CVC financed ventures or perhaps ventures making use of patents can be employed.

## 6. Summary and Outlook

This work dealt with the development process of technology-based ventures and the challenges they are facing within their growth. A special focus has been on the peculiarities of academic entrepreneurship since the Harmonized Instrument Initiative which is closely linked to this work is undertaken by the three German technical universities Karlsruhe Institute of Technology (KIT), Technische Universität Berlin and Technische Universität München.

Deriving from the challenges of growth and the characteristics of growing ventures a questionnaire has been developed which manages the balancing act of tracking the main criteria while not exceeding ten minutes for the completion of the questionnaire.

The resulting questionnaire consists of 45 questions, structured in seven areas of interest: Contact Information, General Information, Connections to University, Finance, Founding Team, Business Concept and Technology, and Market and Competition. The pretests showed an average time for completion of 10' 35" for the first response. The time for completion at following responses should not exceed six minutes since several questions have to be answered at the first time only.

Due to its limited length the questionnaire is not capable of tracking all relevant information of venture development. Open issues have been stated clearly in this work and hence starting points for additional research in this area are given.

The implementation of the questionnaire starts in the beginning of 2013 at the universities in Karlsruhe and Munich. Berlin will join in the end of 2014 and the questionnaire will then be employed every two years by all three universities synchronously. Additional universities in Germany, the German-speaking area or other European countries are kindly invited to join the initiative and hence allow an unprecedented comparability of different entrepreneurship ecosystems through a harmonized instrument for analysis. With further universities joining the initiative an even bigger set of companies can be examined and a new level of

cooperation in entrepreneurship research in Germany or even Europe will be reached.

The data set resulting from HII will be of incomparable size and invaluable for entrepreneurship research and especially research in academic entrepreneurship. It can be the starting point of a much deeper analysis of the foundation activities in Germany and Europe. Universities play a vital role in the start-up ecosystem of technology-based ventures. A deeper understanding of the characteristics and needs of academic entrepreneurship allows for a focusing of public efforts in the support of new ventures as well as an optimization of the services of universities.

With deeper insights in the development processes of technology-based ventures there is an added value not only for universities, but also for the understanding of entrepreneurship in general. New findings may contribute to the theory of venture life cycle and supporting activities may be tailor-made for the needs of the specific phase of the respective venture. For further research the database created will be of inestimable value since additional questionnaires may be addressed to subsets of the registered ventures.

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Appendix A: Life Cycle Models (Bessant *et al.* 2005, tab. 1)

## Appendix B: Complete Questionnaire

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- Abramson, H. Norman (1997): Technical Transfer Systems in the United States & Germany: Lessons and Perspectives. Washington, DC: National Academy Press
- Acatech (2010): Wirtschaftliche Entwicklung von Ausgründungen aus außeruniversitären Forschungseinrichtungen. Deutsche Akademie der Technikwissenschaften: Acatech berichtet und empfiehlt; Nr. 4. Berlin, Heidelberg: Springer-Verlag
- Agarwal, Rajshree / Echambadi, Raj / Franco, April M. / Sarkar, Mb (2004): Knowledge Transfer through Inheritance: Spin-out Generation, Development, and Survival. *Academy of Management Journal*, Vol. 47, 4: 501-522.
- Ahmad, Nadim / Hoffman, Anders (2008): A Framework for Addressing and Measuring Entrepreneurship. OECD Statistics Working Paper, No. 2008/02 [Retrieved on 2012-04-05 from <http://www.oecd.org/dataoecd/21/51/39629644.pdf>]
- Barringer, Bruce R. / Ireland, R. Duane (2012): Entrepreneurship: Successfully Launching new Ventures. Fourth Edition. Essex: Pearson Education Limited
- Bessant, Jon / Phelps, Bob / Adams, Richard (2005): External Knowledge: A Review of the Literature Addressing the Role of External Knowledge and Expertise at Key Stages of Business Growth and Development. Advanced Institute of Management (AIM), Final Report, ISSN 0-9551850-0-9, London.
- Block, Zenas / MacMillan, Ian C. (1985): Milestones for Successful Venture Planning. *Harvard Business Review*, Vol. 63, 5: 184-196
- Boag, David A. (1987): Marketing control and performance in early-growth companies. *Journal of Business Venturing*, Vol. 2, 4: 365-379
- Bruno, Albert V. / Tyebjee, Tyzoon T. (1985): The entrepreneur's search for capital. *Journal of Business Venturing*. Vol. 1, 1: 61-74

- Bryman, Alan / Bell, Emma (2003): *Business Research Methods*. Oxford: Oxford University Press
- Burgel, Oliver / Murray, Gordon C. (2000): The International Market Entry Choices of Start-Up Companies in High-Technology Industries. *Journal of International Marketing*, Vol. 8, 2: 33-62
- Blundel, Richard / Lockett, Nigel (2011). *Exploring Entrepreneurship: Practices and Perspectives*. Oxford: Oxford University Press
- Carson, David J. (1993): The Evolution of Marketing in Small Firms. *European Journal of Marketing*, Vol. 19, 5: 7 - 16
- Churchill Neil C. / Lewis, Virginia L. (1983): The Five Stages of Small Business Growth. *Harvard Business Review*, Vol. 61, 3: 30-50
- Clarysse, Bart / Moray, Nathalie (2004): A process study of entrepreneurial team formation: the case of a research-based spin-off. *Journal of Business Venturing*, Vol. 19, 1: 55-79
- Clarysse, Bart / Wright, Mike / Lockett, Andy / Van de Velde, Els / Vohora, Ajay (2005): Spinning out new ventures: a typology of incubation strategies from European research institutions. *Journal of Business Venturing*, Vol. 20, 2: 183-216
- Clarysse, Bart / Wright, Mike / Lockett, Andy / Mustar, Philippe / Knockaert, Mirjam (2007): Academic spin-offs, formal technology transfer and capital raising. *Industrial and Corporate Change*, Vol. 16, 4: 609-640
- Colombo, Massimo G. / Grilli, Luca / Piva, Evila (2006): In search of complementary assets: The determinants of alliance formation of high-tech start-ups. *Research Policy*, Vol. 35, 8: 1166-1199.
- Davila, Antonio / Foster, George / Jia, Ning (2010): Building Sustainable High-Growth Startup Companies: Management Systems as an Accelerator. *California Management Review*, Vol. 52, 3: 79-105

- De Clercq, Dirk / Fried, Vance H. / Lehtonen, Oskari / Sapienza, Harry J. (2006): An Entrepreneur's Guide to the Venture Capital Galaxy. Academy of Management Perspectives, Vol. 20, 3: 90-112
- Dollinger, Marc J. (2003): Entrepreneurship: Strategies and Resources. Upper Saddle River, NJ: Pearson US Imports & PHIPES
- Drucker, Peter F. (2011): Innovation and Entrepreneurship: Practice and Principles. London and New York: Routledge
- Dushnitsky, Gary / Shapira, Zur (2010): Entrepreneurial Finance Meets Organizational Reality: Comparing Investment Practices and Performance of Corporate and Independent Venture Capitalists. Strategic Management Journal, Vol. 31, 9: 990-1017
- Dushnitsky, Gary / Shaver, J. Myles (2009): Limitations to Interorganizational Knowledge Acquisition: The Paradox of Corporate Venture Capital. Strategic Management Journal, Vol. 30, 10: 1045-1064
- Egeln, Jürgen / Gottschalk, Sandra / Rammer, Christian / Spielkamp, Alfred (2002): Spinoff-Gründungen aus der öffentlichen Forschung in Deutschland: Kurzfassung; Gutachten für das Bundesministerium für Bildung und Forschung, ZEW-Dokumentation, No. 03-02, urn:nbn:de:bsz:180-madoc-9664, <http://hdl.handle.net/10419/39158>
- Franzoni, Chiara / Lissoni, Francesco (2006): Academic entrepreneurship, patents, and spin-offs: critical issues and lessons for Europe [Retrieved on 2012-10-27 from <ftp://openlib.org/opt/ReDIF/RePEc/cri/papers/WP180FranzoniLissoni.pdf>]
- Frei, Patrik (2006): Assessment and Valuation of high growth companies. Bern/ Stuttgart/ Wien: Haupt Verlag.
- Fueglistaller, Müller, Müller, Volery (2012): Entrepreneurship: Modelle – Umsetzung – Perspektiven. Mit Fallbeispielen aus Deutschland, Österreich und der Schweiz. 3. Auflage. Wiesbaden: Gabler Verlag.

- Gardner, John W. (1965): How to prevent organizational dry rot. *Rice Thresher*, Vol. 53, 5: 2
- Gomes-Casseres, Benjamin (1997): Alliance Strategies of Small Firms. *Small Business Economics*, Vol. 9, 1: 33-44
- Greiner, Larry E. (1998): Evolution and Revolution as Organizations Grow. *Harvard Business Review*, Vol. 76, 3: 55-67
- Gübeli, Manuel H. / Doloreux, David (2005): An empirical study of university spin-off development. *European Journal of Innovation Management*, Vol. 8, 3: 269-282
- Gummesson, Evert (2004): Return on relationships (ROR): the value of relationship marketing and CRM in business-to-business contexts. *Journal of Business & Industrial Marketing*, Vol. 19, 2: 136-148
- Hanks, Steven H. / Watson, Collin J. / Jansen, Erik / Chandler, Gaylen N (1993): Tightening the Life-Cycle Construct: A Taxonomic Study of Growth Stage Configurations in High-Technology Organizations. *Entrepreneurship: Theory and Practice*, Vol. 18, 2: 5-30
- Hansen, David J. / Shrader, Rodney / Monllor, Javier (2009): Composite Definitions of Entrepreneurial Opportunity and Their Operationalizations: Toward a Typology. *Frontiers of Entrepreneurship Research*, Vol. 29, 17: 1-15
- Helm, Roland / Mauroner, Oliver (2007): Success of research-based spin-offs. State-of-the-art and guidelines for further research. *Review of Managerial Science*, Vol. 1, 3: 237-270
- Hermann von Helmholtz-Gemeinschaft Deutscher Forschungszentren e.V. (Publisher) (2010): Wissens- und Technologietransfer in der Helmholtz-Gemeinschaft. Berlin: Hermann von Helmholtz-Gemeinschaft Deutscher Forschungszentren e.V. [Retrieved on 2012-09-12 from [http://www.helmholtz.de/fileadmin/user\\_upload/publikationen/pdf/10\\_Helmholtz\\_Technologietransfer\\_dt\\_final.pdf](http://www.helmholtz.de/fileadmin/user_upload/publikationen/pdf/10_Helmholtz_Technologietransfer_dt_final.pdf)]

- Hiscocks, Peter (2005) Performance of New Business Ventures from the University of Cambridge [Retrieved on 2012-10-27 from <http://www-mmd.eng.cam.ac.uk/ctm/teg/documents/PGHpaper40805.pdf>]
- Ivanov, Vladimir I. and Xie, Fei (2010): Do Corporate Venture Capitalists Add Value to Start-Up Firms? Evidence from IPOs and Acquisitions of VC-Backed Companies. *Financial Management*, Vol. 39, 1: 129-152
- Kazanjian, Robert K. (1988): Relation of Dominant Problems to Stages of Growth in Technology-Based New Ventures. *The Academy of Management Journal*, Vol. 31, 2: 257-279
- KfW Bankengruppe (2011): Beteiligungsgrundsätze zur Durchführung des ERP-Startfonds. Bestellnummer: 600 000 1614. [Retrieved on 2012-04-02 from [http://www.kfw.de/kfw/de/I/II/Download\\_Center/Foerderprogramme/versteckter\\_Ordner\\_fuer\\_PDF/6000001614\\_AB\\_136\\_Beteiligungsgrundsaeetze.pdf](http://www.kfw.de/kfw/de/I/II/Download_Center/Foerderprogramme/versteckter_Ordner_fuer_PDF/6000001614_AB_136_Beteiligungsgrundsaeetze.pdf)]
- Kimberly, John R. (1976): Issues in the Design of Longitudinal Organizational Research. *Sociological Methods & Research*, Vol. 4, 3: 321-347
- Knight, Gary (2000): Entrepreneurship and Marketing Strategy: The SME under Globalization. *Journal of International Marketing*, Vol. 8, 2: 12-32
- Kulicke, Marianne / Stahlecker, Thomas / Lo, Vibien / Wolf, Björn (2006): EXIST - Existenzgründungen aus Hochschulen: Bericht der wissenschaftlichen Begleitung zum Förderzeitraum 1998 bis 2005 (Kurzfassung) (Forschungsbericht Nr. 555). Berlin: Bundesministerium für Wirtschaft und Technologie. [Retrieved on 2012-09-12 from [http://www.exist.de/imperia/md/content/pdf\\_sonstiges/forschungsbericht\\_555.pdf](http://www.exist.de/imperia/md/content/pdf_sonstiges/forschungsbericht_555.pdf)]
- Kulicke, Marianne / Görisch, Jens (2002): Welche Bedeutung haben Hochschulen für das regionale Gründungsgeschehen? Umfrage der wissenschaftlichen Begleitung zu 'EXIST—Existenzgründungen aus Hochschulen'. Fraunhofer ISI, Stuttgart

- Leedy, Paul D. / Ormrod, Jeanne E. (2010): Practical Research: Planning and Design. Ninth Edition. Upper Saddle River, NJ: Pearson Education, Inc.
- Leleux, Benoît / Surlemont, Bernard (2003): Public versus private venture capital: seeding or crowding out? A pan-European analysis. *Journal of Business Venturing*, Vol. 18, 1: 81-104
- Lerner, Josh (2002): When Bureaucrats meet Entrepreneurs: the Design of Effective 'Public Venture Capital' Programmes. *The Economic Journal*, Vol. 112, 477: F73-F84
- Lippitt, Gordon L. / Schmidt, Warren H. (1968): Crises in a developing organization. *Harvard Business Review*, Vol. 45, 6: 102-112
- Matuschka, Agnes von / Fajga, Kristina (2011): Patent verwertet: Gründungsumfrage 2010/11 der TU Berlin. Berlin: Technische Uni Berlin
- Miller, Danny / Friesen, Peter H. (1984a): A Longitudinal Study of the Corporate Life Cycle. *Management Science*, Vol. 30, 10: 1161 - 1183
- Miller, Danny / Friesen, Peter H. (1984b): *Organizations: A quantum view*. Englewood Cliffs, NJ: Prentice Hall
- Miller, Danny / Friesen, Peter H. (1982): The Longitudinal Analysis of Organizations: A Methodological Perspective. *Management Science*, Vol. 28, 9: 1013-1034
- O'Shea, Rory / Chugh, Harveen / Allen, Thomas J. (2007): Determinants and consequences of university spinoff activity: a conceptual framework. *The Journal of Technology Transfer*, Vol. 33, 6: 653-666
- O'Shea, Rory / Allen, Thomas J. / O'Gorman, Colm / Roche, Frank (2004): Universities and Technology Transfer: A Review of Academic Entrepreneurship Literature. *Irish Journal of Management*, Vol. 25, 2: 11-29
- Pettigrew, Andrew M. (1990): Longitudinal Field Research on Change: Theory and Practice. *Organization Science*, Vol. 1, 3: 267-292

Porst, Rolf (1998): Im Vorfeld der Befragung: Planung, Fragebogenentwicklung, Pretesting. ZUMA-Arbeitsbericht 98/02 [Retrieved on 2012-04-12 from [http://www.soz.uni-heidelberg.de/assets/soz\\_download\\_406.pdf](http://www.soz.uni-heidelberg.de/assets/soz_download_406.pdf)]

Porst, Rolf (2011): Fragebogen: Ein Arbeitsbuch. Dritte Auflage. Wiesbaden: VS-Verlag

Porter, Michael E. (2008): The Five Competitive Forces That Shape Strategy. Harvard Business Review, Vol. 86, 1: 23-40

Porter, Michael E. (1998): Competitive Strategy: Techniques for Analyzing Industries and Competitors: with a New Introduction. New York, London, Toronto, Sydney, Tokyo, Singapore: Free Press

Rasmussen, Einar / Mosey, Simon / Wright, Mike (2011): The Evolution of Entrepreneurial Competencies: A Longitudinal Study of University Spin-Off Venture Emergence. Journal of Management Studies, Vol. 48, 6: 1314-1345

Rider, Christopher I. (2009): Constraints on the Control Benefits of Brokerage: A Study of Placement Agents in U.S. Venture Capital Fundraising. Administrative Science Quarterly, Vol. 54, 4: 575-601

Ries, Eric (2011): The lean startup: how today's entrepreneurs use continuous innovation to create radically successful businesses. New York: Crown Business

Riffelmacher, Martin (2006): Erfolgreiche Zusammenarbeit von Business Angels und Start-Ups in der Schweiz, Dissertation ETH Zürich, Cuvillier Verlag Göttingen.

Robinson, William T. (1990): Product Innovation and Start-up Business Market Share Performance. Management Science, Vol. 36, 10: 1279-1289

Rogers, Everett M. (1995): Diffusion of Innovations. Fourth Edition. New York, London, Toronto, Sydney, Tokyo, Singapore: Free Press

Schefczyk, Michael (2007): Finanzieren mit Venture Capital und Private Equity. Stuttgart: Schäffer-Poeschel Verlag.

- Sexton, Donald L. / Upton, Nancy B. / Wacholtz, Larry E. / McDougall, Patricia P. (1997): Learning Needs of Growth-Oriented Entrepreneurs. *Journal of Business Venturing*, Vol. 12, 1: 1-8
- Shane, Scott / Stuart, Toby (2002): Organizational Endowments and the Performance of University Start-Ups. *Management Science*, Vol. 48, 1: 154-170
- Smilor, Raymond W. / Gibson, David V. / Dietrich, Glenn B. (1990): University Spin-Out Companies: Technology Start-Ups from UT-Austin. *Journal of Business Venturing*, Vol. 5, 1: 63-76.
- Steffensen, Morten / Rogers, Everett M. / Speakman, Kristen (2000): Spin-Offs from Research Centers at a Research University. *Journal of Business Venturing*, Vol. 15, 1: 93-111
- Stros, Michel / Schnüriger, Walter / Hari, Jürg (2002): Klare Sicht auf Biotechnologie: Die Stocks-Methodik zur Bewertung von Biotech-Unternehmen. *New Management*, No. 4: 42-47
- Stuart, Robert / Abetti, Pier A. (1987): Start-up Ventures: Towards the prediction of initial success. *Journal of Business Venturing*, Vol. 2, 3: 215-230
- Vohora, Ajay / Wright, Mike / Lockett, Andy (2004): Critical Junctures in the Development of University High-Tech Spinout Companies. *Research Policy*, Vol. 33, 1: 147-175
- Volkman, Christine K. / Tokarski, Kim Oliver (2007): Entrepreneurship: Gründung und Wachstum von jungen Unternehmen. Stuttgart: Lucius & Lucius
- Walter, Achim / Auer, Michael / Ritter, Thomas (2006): The impact of network capabilities and entrepreneurial orientation on university spin-off performance. *Journal of Business Venturing*, Vol. 21, 4: 541-567
- Weber, Christiana (2009): Corporate Venture Capitalists with a 'Bird's-Eye View' – A Dynamic Social Network Perspective. *Schmalenbach Business Review*, Vol. 61, 2: 195-224

Williams, Frederick, and Gibson, David V. (1990): *Technology Transfer: A Communication Perspective*. Newbury Park, CA: Sage.

Wright, Mike / Clarysse, Bart / Mustar, Philippe / Lockett, Andy (2007): *Academic Entrepreneurship in Europe*. Cheltenham: Edward Elgar.

Wright, Mike / Lockett, Andy / Clarysse, Bart / Binks, Martin (2006): University spin-out companies and venture capital. *Research Policy*, Vol. 35, 4: 481-501

Zinkhan, George M. (2002): Relationship Marketing: Theory and Implementation. *Journal of Market-Focused Management*, Vol. 5, 2: 83–89

## Ehrenwörtliche Erklärung

Hiermit erkläre ich ehrenwörtlich, dass ich die vorliegende Arbeit selbstständig angefertigt habe; die aus fremden Quellen direkt oder indirekt übernommenen Gedanken sind als solche kenntlich gemacht. Die Arbeit wurde bisher keinem anderen Prüfungsamt vorgelegt und auch noch nicht veröffentlicht.

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