2 Literature review and research gap

The following chapter introduces the literature of academic spin-offs, covering several aspects. In the first section, different definitions of spin-off companies are presented to outline the boundaries and highlight several important differences between spin-offs and traditional start-up companies. In this context, certain existing typologies are also briefly described. On this basis, the target group of the underlying study is specified. The next step provides an overview of prior research in the field of academic entrepreneurship and outlines the scope and theoretical approaches of the studies. The following section discusses entrepreneurial and management teams in research-based spin-off companies, thus determining the central focus of this study. The main point of interest draws upon those factors, also referred to as success factors, which influence outcomes at the organisational level, such as performance. This chapter concludes by identifying the research gap and formulating the research question as the starting point for further analysis.

2.1 Overview of existing definitions

In prior studies, research-based spin-off companies have been defined as new ventures based on the transfer of technology or academic knowledge developed by public research organisations with a focus on the commercialisation of the research results. In this context, spin-offs are discussed from various perspectives, that is, from the university or firm level, for instance. Despite the increasing attention paid to the spin-off process and activities, however, most authors do not give a strict and clear definition of a research-based spin-off, thus making it difficult to compare the results of different studies (Pirnay, Surlemont, and Nlemvo, 2003). Table 2.1 provides an overview of the definitions of the spin-off phenomenon and indicates how authors clarify the concept in several ways, including similarities and differences. Researchers have used a broad variety of terms, such as spin-off or spin-out companies; university, academic, and research-based spin-offs; new technology-based ventures or high-tech start-ups, thus demonstrating the plurality of definitions in the field.[1]

[1] Discussed in more detail in De Cleyn and Braet (2009), referring to: Kazanjian (1988), Dahlstrand (1997), Feldman and Klofsten (2000), Di Gregorio and Shane (2003), Jagersma and van Gorp (2003), Kakati (2003), Meyer (2003), O'Shea, Allen et al. (2004), Vohora, Wright, and Lockett (2004), Aspelund, Berg-Utby, and Skjevdal (2005), Lockett, Siegel et al. (2005), Aaboen, Lindelöf et al. (2006), Mustar, Renault et al. (2006)

R. Tietz, *Executive Teams in Research-Based Spin-Off Companies,*
DOI 10.1007/978-3-658-01215-1_2, © Springer Fachmedien Wiesbaden 2013

Table 2.1: Definitions of academic spin-off companies

Authors	Year	Definition
McQueen and Wallmark	1982	"… in order to be classified as a university spin-off, three criteria have to be met: (1) the company founder or founders have to come from a university (faculty staff or student); (2) the activity of the company has to be based on technical ideas generated in the university environment; and (3) the transfer from the university to the company has to be direct and not via an intermediate employment somewhere" (p. 307).
Smilor, Gibson, and Dietrich	1990	"a company that is founded (1) by a faculty member, staff member, or student who left the university to start a company or who started the company while still affiliated with the university; and/or (2) around a technology or technology-based idea-developed within the university" (p. 63).
Weatherston	1995	"… an academic spin-off can be described as a business venture which is initiated, or become commercially active, with the academic entrepreneur playing a key role in any or all of the planning, initial establishment, or subsequent management phases" (p. 1).
Dahlstrand	1997	"An entrepreneurial spin-off arises when an entrepreneur leaves a company to start a firm of his own. To be a spin-off, this must also include the transfer of some rights, e.g., assets or knowledge, from the existing legal body to the new firm or body" (p. 2).
Carayannis, Elias et al.	1998	"…a new company formed by individuals who were former employees of a parent organization (the university), around a core technology that originated at a parent organization and that was transferred to the new company" (p. 1).
Bellini, Capaldo et al.	1999	". . . academic spin-offs are companies founded by university teachers, researchers, or students and graduates in order to commercially exploit the results of the research in which they might have been involved at the university … the commercial exploitation of scientific and technological knowledge is realised by university scientists (teachers or researchers), students and graduates" (p. 2).
Rappert, Webster, and Charles	1999	"University spin-offs are firms whose products or services develop out of technology-based ideas or scientific/technical know-how generated in a university setting by a member of faculty, staff or student who founded (or co-founded with others) the firm" (p. 874).
Clarysse, Heirman, and Degroof	2000	". . . Research-based spin-offs are defined as new companies set up by a host institute (university, technical school, public/private R&D department) to transfer and commercialize inventions resulting from the R&D efforts of the departments" (p. 546).

Table 2.1: Definitions of academic spin-off companies (continued)

Authors	Year	Definition
Klofsten and Jones-Evans	2000	"… formation of new firm or organisation to exploit the results of the university research" (p. 300).
Steffensen, Rogers, and Speakman	2000	"A spin-off is a new company that is formed (1) by individuals who were former employees of a parent organization, and (2) a core technology that is transferred from the parent organization" (p. 97).
Nicolaou and Birley	2003	"Spinouts involve: (1) the transfer of a core technology from an academic institution into a new company and (2) the founding member(s) may include the inventor academic(s) who may or may not be currently affiliated with the academic institution" (p. 333).
Clarysse and Moray	2004	"A common two-dimensional definition of a research based spin-off is a new company that is formed (1) 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; and/or (2) a core technology (or idea) that is transferred from the parent organisation" (p. 59).
Hindle and Yencken	2004	"Direct research spin-offs are companies which have been created in order to commercialise IP arising out of a research institution where IP is licensed, involving a patent or copyright, from the research institution to the new firm to form the founding IP of the firm and staff may be seconded or transferred full or part-time from the research institution to the new firm" (p. 5-6). "Start-ups or indirect spin-off companies are companies set up by former or present university staff and/or former students drawing on their experience acquired during their time at the university, but which have no formal IP licensing or similar relationships to the university" (p. 6).
Shane	2004	"… a new company founded to exploit a piece of intellectual property created in an academic institution" (2004, p. 4).
De Coster and Butler	2005	"University spin-off companies are high-technology ventures that originate from research work in a university, resulting in the generation of intellectual property and, usually, subsequent involvement of key researchers" (p. 535).
Leitch and Harrison	2005	"Spin-outs are defined as new companies formed around a core technology discovered in a lab. The parent organisation sells, licences or somehow transfers the technology to the spin-out, which is often founded by researchers from the parent company or campus" (p. 259).

Many scholars have referred to the definition introduced by Smilor, Gibson, and Dietrich (1990, p. 63). "A spin-off is a company that is founded (1) by a faculty member, staff member, or student who left the university to start a company or who started the company while still affiliated with the university; and/or (2) around a technology or technology-based idea developed within the university".

The main differences and similarities concern the individuals who are involved as entrepreneurs, their relationships to the parent institution, and the knowledge or technology on which the business is based (Pirnay, Surlemont, and Nlemvo, 2003). Regarding the individuals, some studies have taken only faculty members or former employees such as researchers or lecturers into consideration (e.g., Carayannis, Rogers et al., 1998; Steffensen, Rogers, and Speakman, 2000), whereas other authors have also considered students or graduates as potential founders of an academic spin-off (e.g., McQueen and Wallmark, 1982; Smilor, Gibson, and Dietrich, 1990; Rappert, Webster, and Charles, 1999).

Many authors consider technology a key component of a spin-off, that is, technical ideas (McQueen and Wallmark, 1982), technology or technology-based ideas (Smilor, Gibson, and Dietrich, 1990), core technology (Carayannis, Rogers et al., 1998; Steffensen, Rogers, and Speakman, 2000; Nicolaou and Birley, 2003; Clarysse and Moray, 2004; Leitch and Harrison, 2005), or high technology (De Coster and Butler, 2005). The definitions given in previous studies, however, do not agree on the nature of the technology or the knowledge that must be transferred from the parent institution to the new spin-off company. It can be a core technology protected by patents or knowledge generated within a research project. Some scholars emphasise the technology transfer process (e.g., Shane, 2004). Furthermore, some studies address the role the parent institution plays in the spin-off process. Clarysse, Heirman, and Degroof (2000) assess the parent institution as playing an active role in initiating the spin-off.

2.2 Typologies of academic spin-offs

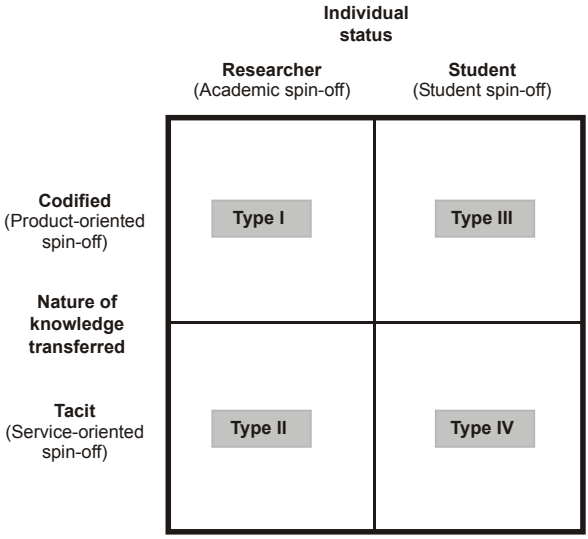
The definitions presented in the previous chapter do not have clear boundaries. In particular, if the entrepreneurial team can consist completely of students, for instance, any type of knowledge transfer is sufficient to meet the given definitions. Therefore, in the next paragraph, spin-off companies with different characteristics are framed. Several classifications and typologies have been developed to systematically describe the spin-off phenomenon (e.g., Stankiewicz, 1994; Pirnay, Surlemont, and Nlemvo, 2003; Hindle and Yencken, 2004; Wright, Clarysse et al., 2007). A typology generally outlines different conceptual types of organisations that may or may not exist, whereas a classification scheme

categorises a set of phenomena into different subsets (Doty and Glick, 1994). The observed objectives often do not fully belong to any one ideal type; rather, this perspective allows for a more theoretical view of the phenomena and relationships. Although spin-off companies are often assumed to belong to high-tech ventures, they can also be established within a non-technology context (De Cleyn and Braet, 2009).

Pirnay, Surlemont, and Nlemvo (2003) proposed a typology based on two key discriminatory factors. These factors are (1) the academic status of the individuals who are involved in the new venture and (2) the type of knowledge that is transferred. Concerning academic status, a differentiation is made between entrepreneurs with a scientific background, such as professors or researchers, and founders without substantial research experience, more similar to students. Spin-offs with a scientific background typically try to commercialise research findings with promising prospects for future success. Therefore, researchers and occasionally students are engaged in this type of spin-off. With regard to types of knowledge, both codified knowledge and tacit knowledge can be transferred to the spin-off company. Codified knowledge is usually distinct from the researcher who developed it. Because it relies on formal information such as publications, research reports, or even patents, it is easily accessible and can be used or reproduced by other individuals. Tacit knowledge, such as experiences or technical expertise, is generally related to the researcher who acquired this type of knowledge within his or her academic career. Spin-off companies exploiting codified knowledge are primarily product-oriented, whereas ventures are based on tacit knowledge and often operate in the service sector (Nlemvo, Pirnay, and Surlemont, 2002).

Referring to Heirman and Clarysse (2004), Wright, Clarysse et al. (2007) distinguished between the VC-backed, prospector, and lifestyle types. According to this typology, the VC-backed spin-off is based on codified knowledge and, thus, is often protected by intellectual property. The prospector and the lifestyle types do not necessarily rely on patents or license agreements with the parent institutions. Although most visible and recognised, the VC-backed type comprises only a minority of spin-offs. Built on disruptive technology, it attracts investors to achieve growth and further development. Most spin-offs belong to the prospector or lifestyle category. Both types of companies start with a small entity and try to reach the break-even point quickly. The lifestyle type usually does not rely on a formal transfer of technology and is driven by market acceptance rather than investor acceptance, while the prospector type can be built on technology and attract a limited amount of external capital. The configuration of the spin-off company may have an impact on strategy and performance. Ventures based on codified knowledge might be more technology-driven, whereas spin-offs built on tacit knowledge are more market-driven (De Cleyn and Braet, 2009). For this reason, this study will consider basic characteristics of the ventures as possible influencing factors for strategy and performance.

Figure 2.1: Typology of university spin-offs



Source: Pirnay, Surlemont, and Nlemvo (2003, p. 361)

2.3 Definition of the target group

The target group of this study is research-based spin-off companies from academic organisations. To enable comparability with other studies, the main concepts of an academic organisation and a research-based spin-off company must be clearly specified. Therefore, within this study, a spin-off is defined as follows. "Research-based spin-offs are new ventures created to exploit commercially knowledge, technology, or research results developed within a research institution". This definition is based on Pirnay, Surlemont, and Nlemvo (2003), Klofsten and Jones-Evans (2000), and De Cleyn and Braet (2009). In addition to the definition, further analysis only considers companies that meet the following criteria:

a) New company: The spin-off must have the legal structure of a new firm. Neither establishing an extension or a subsidiary of the research institute nor transforming an existing company is considered a spin-off.
b) Parent organisation: The new company must have emerged from an academic organisation that is specified as a research institute financed mainly by public funding. This definition predominantly includes universities but also covers universities for applied science and colleges as long as they are engaged in research activities. Furthermore, the

study considers non-university research organisations, such as the Max-Planck Gesellschaft in Germany. The given delineation does not comprise companies or private laboratories.

c) Knowledge and technology transfer: The spin-off commercialises scientific knowledge that may include technological innovations or patents and individual know-how. The knowledge was generated within an academic career in the research institute and transferred to the new company. The transfer can take place in several ways such as researchers joining the spin-off, transfer of protected intellectual property via sale or licensing agreements.

d) Profit-making objective: The founding of the new business should have generating profit as a main objective. Therefore, non-profit organisations are not considered.

2.4 Scope of prior studies

Companies that have emerged from the academic environment have recently attracted growing interest among scholars, as documented by several reviews of the literature (e.g., O´Shea, Allen et al., 2004; Rothaermel, Agung, and Jiang, 2007; Djokovic and Souitaris, 2008; Yusof and Jain, 2010). The majority of studies have been conducted in the US context, where commercialising new technology via spin-off companies has been a common path in the technology transfer process for much longer than in Europe (Clarysse, Wright et al., 2005). Most studies have only considered a single country or a particular research institute.

Different perspectives and frameworks have been applied and are identified by various terms such as university entrepreneurship, academic entrepreneurship, or university-level entrepreneurship. Previous research has been dominated by studies that focus on issues such as commercialisation strategies and technology transfer processes in research organisations, governmental support schemes, and legislative frameworks. These studies have been published in journals such as Management Science, The Journal of Technology Transfer, Research Policy, and The Journal of Business Venturing. For this reason, the majority of studies in the context of academic spin-offs have looked at factors that influence spin-off activity and the creation of new ventures.

In a comprehensive literature review, Rothaermel, Agung, and Jiang (2007) classified studies in the field of university entrepreneurship into four categories: (1) entrepreneurial research universities, (2) productivity of technology transfer offices, (3) new firm creation, and (4) environmental context. The first line of research, which represents approximately half of the field, looks at activities and schemes that encourage universities to become entrepreneurial. The second category deals with the impact of technology transfer offices as a

gateway between the university and industry and accounts for approximately 10 per cent of the studies. The last category addresses environmental factors and accounts for 15 per cent of the research. The present study is related primarily to the third stream, that of new firm creation, which comprises approximately 25 per cent of the prior research in the area of university entrepreneurship. In this context, Rothaermel, Agung, and Jiang (2007) identified different measurements used in the examined studies that cover the number of new ventures established, their performance and their development as measured by indicators such as survival, growth, VC-funding, IPO, and specific characteristics of the companies. By focussing on new firm creation as a dependent variable, several possible influencing factors were identified, such as the university system, including faculty and technology transfer offices, the underlying technological base, investors, and the founding team and their network. With respect to the founding team, experience, qualification, social capital, team composition, and diversity are all relevant factors.

The methodological approaches that were applied most often include quantitative regression methods to measure the performance of technology transfer offices or research institutes in terms of spin-off formation rates. However, concerning the team level, quantitative empirical studies are rare as the majority of studies have conducted qualitative methods based on case studies (Rothaermel, Agung, and Jiang, 2007).

2.5 Theoretical perspectives

Some authors have noted that many empirical studies lack a well-grounded theoretical explanation for the observed relationships and phenomena (e.g., Nicolaou and Birley 2003; O'Shea, Allen et al. 2004; Rothaermel, Agung, and Jiang, 2007; Djokovic and Souitaris 2008). However, academic entrepreneurship is still in an early stage as an independent field of research where "a 25-year history is considered a very short time when compared with, for example, the 50-year history of strategy or the more than 225-year history of economics" (Rothaermel, Agung, and Jiang, p. 9). Furthermore, Davidsson and Wiklund (2001) noted that scholars in the entrepreneurship field often take theories from other research disciplines, as there is currently no consensus about an overarching theory of entrepreneurship.

The following paragraph outlines different theoretical views that have been applied in previous studies on research-based spin-off companies. The literature on academic spin-offs has acknowledged the high degree of heterogeneity and diversity among the examined companies and has noted that scholars used different theoretical lenses in their studies. Mustar, Renault et al. (2006) consider research-based spin-off companies as a subgroup of new high-technology ventures that face similar constraints and challenges when developing their businesses. Based on a review of the studies published since 1990 in the fields of

entrepreneurship, strategy, innovation, and public policy, it is worth noting that they frame the research in a multi-dimensional taxonomy and identify three main theoretical perspectives.

A first group of studies examined spin-offs from an institutional perspective, analysing the relationship between the spin-offs and their parent organisations. In this context, researchers question how the mother institutes may affect the initial start-up composition, business model, and further development of the companies (e.g., Carayannis, Rogers et al., 1998; Steffensen, Rogers, and Speakman, 2000; Link and Scott, 2004; Lindelof and Lofsten, 2004; Wright, Birley, and Mosey, 2004; Clarysse, Wright et al., 2005).

Secondly, the framework outlined by Mustar et al. (2006) includes studies that adhere to a business model perspective. A subgroup examined the activities and portfolios of the companies and distinguished between predominantly service-oriented and product-oriented firms on one hand and market-oriented or technology-oriented strategies on the other hand (e.g., Chiesa and Piccaluga, 2000; Bower, 2003; Pirnay, Surlemont, and Nlemvo, 2003). The next subgroup focused on different forms of value creation through technology or knowledge transfer (e.g., Druilhe and Garnsey, 2004; Heirman and Clarysse, 2004). Another subset of studies considered the business models that were interested in the growth orientation of the ventures and differentiated between slow, fast, and transitional growers (e.g., Autio and Lumme, 1998).

Finally, the third view can be considered the resource-based perspective as the studies examine companies that have different resource configurations that influence their performance and competitive advantage. This group of studies refers, to some extent, to the resource-based view of the firm (Barney, 1991). The analysis of predictors of new venture performance has become an important aspect of entrepreneurship research. A number of studies have noted that initial resource stocks may have subsequent influence on organisational outcomes, including performance. Varying initial resources lead to varying outcomes at the organisational level. In this context, extant research has discussed tangible assets, such as financial capital or physical properties, as well as intangible resources, such as knowledge, routines, or collaboration activities (e.g., Radosevich, 1995; Westhead and Storey, 1995; Franklin, Wright, and Lockett, 2001; Shane and Stuart, 2002; Hindle and Yencken, 2004; Wright, Vohora, and Lockett, 2004) .

2.6 Performance in research-based spin-offs

Research at the firm level that investigates and analyses influencing factors for success and performance of new ventures has become fundamental in entrepreneurship research. In this context, it is important to assess those specific outcomes that may indicate successful companies. Whether the focus of the company is more on profitability, sustainability, or some

other aspect depends on the founders', the owners', and/or the stakeholders' viewpoints. However, in previous research, a variety of measures and scales have been established and used that indicate a dependency on the developmental stage of the observed companies.

Prior studies have measured success by looking at the operating figures that reflect the performance, such as profitability, which can be measured by return on investment or by net profit (e.g., Roberts, 1991a; Hemer, Berteit et al., 2005). Another important aspect is the growth of the company, which is reflected by turnover or the number of employees (e.g., Ensley and Hmieleski, 2005; Walter, Auer, and Ritter, 2006). In this respect, research on new ventures must face the problem that these figures are often not available. In an early life-cycle phase, revenue streams might be low and the break-even point has very likely not been reached; thus, firms do not make any substantial profits. Growth rates might be high, as firms tend to be small at the beginning and grow rapidly relative to their size in the early years. Furthermore, data about these companies are not available in public databases. Therefore, self-reported or self-perceived measurements are often used; however, these data need to be considered in terms of objectivity, subjectivity, and reliability.[2] Spin-off success has also been measured by specific milestones, such as raising venture capital funding (e.g., Lockett, Murray, and Wright, 2002; Shane and Stuart, 2002; Zucker, Darby, and Armstrong, 2002), realising an initial public offering (e.g., Goldfarb and Henrekson, 2003; Shane, 2004) and external evaluations such as credit ratings (e.g., Egeln, Gottschalk et al., 2003). Finally, the survival of a company has often been used to assess spin-off success (e.g., Shane and Stuart, 2002; Shane, 2004).

Concerning the performance level, studies indicate that research-based spin-off companies and other new technology-based ventures or traditional start-ups differ. In the United States and Europe, academic spin-offs record lower failure rates or higher survival rates than do other new ventures, on average (e.g., Degroof and Roberts, 2004; Djokovic and Soutaris, 2008). Studies also reported that spin-offs are more likely to survive than other high-tech start-ups in the same industry (e.g., Mustar, 1997; Egeln, Gottschalk et al., 2002). The reasons for these trends, however, are not fully understood. The support mechanisms provided by the parent institution and governmental promotion schemes might yield an advantage during the start-up years. With regard to growth, the findings are inconsistent. For example, Ensley and Hmieleski (2005) reported that spin-offs have a higher annual growth rate in turnover than other technology-based ventures, and according to Egeln, Gottschalk et al. (2002), spin-offs grow faster in terms of employment compared to other firms belonging to the same industry sector. While a small percentage of spin-offs belong to the group of rapidly growing ventures, the majority tend to grow slowly (Autio, 1994; Stankiewicz, 1994; Mustar, 1997; Harrison and Leitch, 2005). Finally, in terms of productivity and externally measured credibility, some

[2] See Chandler (1993) for more details regarding the validity of subjective performance measures

researchers claim that spin-offs perform worse than traditional start-ups (e.g., Berndts and Harmsen, 1985; Egeln, Gottschalk et al., 2002), but according to Colombo and Delmastro (2002), the differences between academic spin-offs and traditional start-ups are negligible.[3]

The discussion regarding the success factors of spin-offs and the possible performance measurements leads to the question of which influencing factors might affect different outcomes at the organisational level. In this context, several frameworks have been introduced (e.g., Szyperski and Klandt, 1981; Kulicke, 1987; Unterkofler, 1989; Roberts, 1991a; Ndonzuau, Pirnay and Surlemont, 2002; Helm and Mauroner, 2007). In a literature review of the success factors of academic spin-off companies, Helm and Mauroner (2007) built on the framework for new venture creation introduced by Gartner (1985), noting three key categories. First, factors regarding the founders and the founding team were mentioned (individual/team level). This category includes demographic characteristics such as age and gender, which were not found to have a significant impact (Roberts, 1991a). However, skills, knowledge, and capabilities, also called human capital, significantly affect the performance of spin-offs, whereas personality and entrepreneurial motivation only partially influence success. The second category covers the organisational level, including general attributes of the spin-off itself, such as age or size. Furthermore, this aspect refers to the resource-based view stating that technological, financial, and social resources of the company have a significant impact on the performance (Helm and Mauroner, 2007). Finally, the discussion about factors regarding the environmental level incorporate the location of the company, institutional environment, market, and industry-specific aspects as well as the characteristics of and support from the parent institution (Helm and Mauroner, 2007).

This study focuses on human capital, mainly on the impact of the founding, entrepreneurial, and management team on organisational outcomes, such as firm performance, which will be discussed in the remainder of this chapter.

2.7 Boundaries of the entrepreneurial and management team

Previous research has, for the most part, agreed about the relevance of entrepreneurs, owners, and managers as the key resource assets and influence factors for the growth and performance of small companies and new ventures, in particular (e.g., Bruno, Leidecker, and Harder, 1987; Watson, 1995; Shane, 2000). In this context, studies have analysed the characteristics of founders and owner-managers with the entrepreneur as the unit of analysis (Davidsson and Wiklund, 2001). According to the literature, which has examined the human resources of new ventures, primary competencies of a high-technology company depend on the competencies

[3] See Ensley and Hmieleski (2005) for more details with regard to differences between spin-offs and regular start-ups

of the entrepreneurial team (Cooper and Bruno, 1977). Therefore, the growth and performance of spin-offs are closely linked to the characteristics of their founders and owner-managers.

High-tech companies and research-based spin-offs in particular are founded by a team rather than by a single individual (Roberts, 1991a), and high-growth companies are much more likely to be run by an entrepreneurial team as well (Kamm, Shuman et al., 1990). Literature in the field of venture capital, for example, posits that the entrepreneurial team of a company is the most influential factor with respect to decisions about investments (Macmillan, Siegel, and Narasimha, 1985; Hsu, 2007). In this sense, the entrepreneurial team is an intangible asset of the company (Cooper and Daily, 1997). Nevertheless, initially, entrepreneurship research studies regarding entrepreneurs and their attributes were most often conducted from an individual point of view. Recently, however, the team-level perspective has become increasingly important (Birley and Stockley, 2000; Chowdhury, 2005; Beckman, Burton, and O'Reilly, 2007). Although entrepreneurial teams have a significant impact on firm performance (Virany and Tushman, 1986; Kamm, Shuman et al. 1990; Eisenhardt and Schoonhoven 1990; Shane, 2004), they have not been extensively studied (Birley and Stockley, 2000), especially in the context of academic entrepreneurship.

Before discussing the literature and empirical findings on entrepreneurial and management teams in research-based spin-off companies, the boundaries of an entrepreneurial team must be clarified. Table 2.2 presents several existing definitions.[4] According to the definitions, the important aspects in determining an entrepreneurial team include being a member of the founding team, holding an equity stake, participating in decision making, and managing or running the firm on a full-time basis. The question is to which extent these definitions are applicable to research-based spin-offs.

Establishing an academic spin-off can take a long period of time that usually begins with an extensive research phase even before the firm is officially incorporated (Vohora, Wright, and Lockett, 2004). Furthermore, entrepreneurial teams in research-based spin-offs have a dynamic perspective. Vanaelst, Clarysse et al. (2006) distinguished between pre- and post-start-up teams. In addition, entrepreneurial teams in academic spin-offs usually evolve and change in composition over a period of time (Vanaelst, Clarysse et al., 2006). Thus, it is very likely that new members who join the initial team bring in new skills and competencies or replace the academic entrepreneurs who return to the parent institution. For this reason, there might be different entry modes for new members of the entrepreneurial team. A new team member can first be involved as a member of the management team and become a stakeholder of the company later. In this respect, it is very difficult to delineate the boundaries of a spin-off's entrepreneurial team at any specific point in time.

[4] Reviews on new venture team literature: Cooper and Daily (1997), Birley and Stockley (2000)

However, a research-based spin-off that is based on cutting-edge technology and groundbreaking scientific results very often has several stakeholders. The scientists who have been involved in the research projects may elect to join the new venture. Additionally, the representatives of the technology transfer office of the parent institution are very likely involved, for example, if patents or license agreements are concerned. More than likely, external organisations, such as venture capital funds, are represented on the board in the event of external funding. Based on the previous discussion, this study focuses on the executives of spin-off companies who are managing the business and responsible for the decision making. Thus, the terms entrepreneurial, management, and executive team are used synonymously. Further aspects, such as ownership and member of the founding team, will be considered separately. The empirical analysis does not specifically focus on teams with two or more individuals, spin-offs managed by only one executive are included as well.

Table 2.2: Definitions of an entrepreneurial team[5]

Authors	Year	Definition
Cooper and Bruno	1977	"…two or more full-time founders" (p. 20).
Kamm, Shuman et al.	1990	"…two or more individuals who jointly establish a firm in which they have a financial interest" (p. 7).
Eisenhardt and Schoonhoven	1990	"The founding top management team was defined as those individuals who were founders of the firm and who worked full time for the firm in executive-level positions at the time of founding" (p. 515).
Watson, Ponthieu, and Critelli	1995	"A venture team is two or more individuals who jointly establish and actively participate in a business in which they have an equity (financial) interest" (p. 394).
Ensley, Pearson, and Amason	2002	"...define the members of the top management team as being those individuals who met at least two of three conditions. They either were founders, currently held an equity stake of at least 10%, or were identified in some way as being actively involved in strategic decision making" (p. 372).
Chowdhury	2005	"An entrepreneurial team is often characterized as two or more individuals with equity interest jointly launching and actively participating in a business" (p. 730).
Harper	2008	"…a group of entrepreneurs with a common goal that can only be achieved by appropriate combinations of individual entrepreneurial actions" (p. 5).

[5] Further references: Gartner, Shaver et al. (1994), Vanaelst, Clarysse et al. (2006)

2.8 Previous findings about executives in research-based spin-offs

The entrepreneurship literature has discussed several facets of entrepreneurial and management teams. These facets include (1) general demographic characteristics, such as age and gender; (2) human-capital-related aspects of the team, including experience, education, and specific knowledge and capabilities; (3) team composition with respect to heterogeneity or homogeneity; and (4) evolution and dynamics with aspects such as entries and exits, tenure and turnover. In the next section, findings from previous research about entrepreneurial teams in research-based spin-off companies are discussed, including aspects regarding founder and ownership and specific characteristics of the executive teams that must be considered for the upcoming analysis.

Although executive teams of spin-off companies differ in terms of demographic attributes when compared with other start-up companies, the impact on performance is similar (Helm and Mauroner, 2007). Women are generally underrepresented and account just for 6 to 15 per cent of the founders, and only 25 per cent of the spin-off ventures include women (Kriegesmann, 2000; Egeln, Gottschalk et al., 2002). Nevertheless, previous studies do not report any empirical evidence for a significant positive or negative relationship between gender and spin-off success (Helm and Mauroner, 2007). Regarding the age of spin-off founders or the entrepreneurial team, prior research seems to agree that, again, there is no connection between age and the company's success (Roberts, 1991a; Kriegesmann, 2000). In fact, scholars have noted differences in terms of the average age between spin-off and other start-up founders but do not agree about the direction of the impact of these differences. Some studies report a lower average age for spin-off entrepreneurs (e.g., Brüderl, Preisendörfer, and Ziegler, 1996; Kay, May-Strobl, and Maaß, 2001), whereas others argue that the university system generates older entrepreneurs (e.g., Audretsch, 2000). Other demographical factors, such as religion, may influence the willingness to start a company but do not appear to affect the outcome (Kassicieh, Radosevich et al., 1997; Kriegesmann, 2000).

Substantial empirical evidence suggests that the characteristics of the entrepreneurial team, also called human capital, have an impact on spin-off success (Vohora, Wright, and Lockett, 2004; Helm and Mauroner, 2007). Nevertheless, the findings are contradictory. In the early years, the majority of spin-off entrepreneurs have a technical background (Vanaelst, Clarysse et al., 2006; Helm and Mauroner, 2007), and the entrepreneurial team often lack managerial and entrepreneurial experience (Berndts and Harmsen, 1985). Existing industry contacts or experience in the same industry sector within the team has been found to have a positive impact on spin-off success (Steinkühler, 1994; Shane and Stuart, 2002; Nicolaou and Birley, 2003; Scholten, 2006; Walter, Auer, and Ritter, 2006). However, Scholten (2006) reported a negative relationship between previous management experience and growth during

the early years of a company. According to Roberts (1991a), entrepreneurs from research organisations who have prior commercial experience are also less successful, though studies regarding previous entrepreneurial experience have reached ambiguous conclusions. For example, Scholten (2006) noted a positive impact, while other studies did not support these findings and could not identify a significant relationship (e.g., Kassicieh, Radosevich et al., 1997; Kriegesmann, 2000; Shane and Stuart, 2002). Again, while some studies mentioned that educational level has a positive impact on performance (e.g., Hunsdiek, 1987; Steinkühler, 1994; Egeln, Gottschalk et al., 2003), Roberts (1991a) reported a U-shaped relationship, pointing out that additional qualifications beyond the masters level contributes negatively to firm performance.

The composition of an executive team of a research-based spin-off company has several specific characteristics that must be considered. Ensley and Hmieleski (2005) found that management teams of university-based start-ups tend to be more homogeneous regarding their educational background and functional and industry experience than those of other start-ups. Colombo and Delmastro (2002) could not identify significant differences between traditional start-ups and academic spin-offs. In many cases, the academic inventors establish the new ventures themselves. According to Roberts (1991a), founders can work partly for the new venture while still employed at the parent institution and shift their attention to the spin-off. However, Doutriaux (1987) and Roberts (1991a) expressed doubts about the effectiveness of this approach.

According to Vanaelst, Clarysse et al. (2006), entrepreneurial teams in academic spin-offs evolve over time, changing in their composition, so that external entrepreneurs and managers may partly or even completely replace the original founding team. In this context, the configuration of the founding team and the composition of the management team in a later development stage is discussed. Nicolaou and Birley (2003) identified three categories based on the roles of the researchers from the parent institution: (1) technological, (2) hybrid, and (3) orthodox spin-offs. In the first, technology is transferred to the new venture, but the researchers remain in the mother organisation without having a position in the spin-off. The second category defines a setting where the academician is involved in both the new firm and the research institute. In the third model, the researchers leave the parent organisation during the spin-off process. In this context, Olofsson and Wahlbin (1984) noted that rapidly growing spin-offs usually incorporate academics who have left the university environment. In this context, Van Dierdonck and Debackere (1988) differentiated between extra- and intrapreneurial spin-offs, which include researchers who leave or stay, respectively, in the parent institution.

Regarding the role and the background of entrepreneurs and managers in academic spin-offs, Radosevich (1995) outlined two distinct types: (1) the academic entrepreneur, also called

the inventor or technology entrepreneur, and (2) the surrogate entrepreneur. An academic entrepreneur or inventor/technology entrepreneur is an individual who has participated in developing the technology on which the spin-off is based. Although his primary role was that of a lecturer or researcher, he now assumes the role of the entrepreneur in the new venture (Franklin, Wright, and Lockett, 2001). Surrogate entrepreneurship involves an independent and an external entrepreneur, which could be either an individual or an organisation from outside the research institute that initiated the company. The originator of the technology may keep his position in the research institute, in which case both the academic and surrogate entrepreneurs are simultaneously involved.

There is an ongoing debate regarding the effects of the performances of academic and external entrepreneurs and the dependency of their relationships on the development stage of the company or the environmental situation. Several studies examine surrogate entrepreneurship from a theoretical approach, which refers, basically, to resource endowments. Radosevich (1995) noted that surrogate entrepreneurs may play an important role in transferring technology. He argued that inadequate incentives and support mechanisms for scientists in research institutes may change the focus of the scientist's activities. Previous entrepreneurial experience and accumulated business knowledge, including professional networks, risk capital access, and strategic alliances, are advantages of the surrogate entrepreneur model.

Corresponding to a survey of 57 universities in the UK, Franklin, Wright, and Lockett (2001) determined that surrogate entrepreneurs could be an important source of commercial knowledge and skills, perhaps increasing the chances of success. On the contrary, based on a longitudinal case study of Clarysse and Moray (2004), external entrepreneurs from outside the research organisation may not understand the technology and, thus, may not be capable of successfully developing the company. Additionally, researchers rarely accept external managers on the team. Therefore, it is recommended that the original academic founding team include a coach and fill potential knowledge gaps in the learning process. This perspective is supported by Roberts and Hauptman (1986), who stated that academics in the new venture enable a more efficient technology transfer process.

Shane and Stuart (2002), in an analysis of 134 spin-off companies from MIT (US), found that new ventures with founders who have direct and indirect relationships with venture investors are most likely to receive venture funding. Additionally, these companies are less likely to fail. Furthermore, the authors argued that receiving funding is one of the most influential determinants of the likelihood of an IPO. For this reason, social capital assets that might be added by external entrepreneurs have a significant impact on fundraising. Wright, Vohora, and Lockett (2004), using case studies of four spin-offs in the UK, examined joint ventures with a company from the industry as a type of external partner. They concluded that

creating a spin-off as a joint venture could help overcome resource constraints. External managers and entrepreneurs may contribute their business and commercial experiences as well as entrepreneurial knowledge, thus sending an important signal to external investors. Franklin, Wright, and Lockett (2001) suggested that a mixture of academic and surrogate entrepreneurs are an effective way of including both the technical know-how of the inventor as well as a market-oriented background.

2.9 Conclusion and research gap

Research-based spin-off companies differ in many respects from common start-ups (Shane and Stuart, 2002). The university environment implies a few peculiarities and constraints for establishing sustainable companies (Vohora, Wright, and Lockett, 2004). Academic spin-offs have similar characteristics as new technology-based ventures (Mustar, Renault et al., 2006), which are often challenged by several liabilities, such as newness (Stinchcombe, 1965; Freeman, Carroll, and Hannan, 1983), size (Aldrich and Auster, 1986; Brüderl and Schüssler, 1990), adolescence (Brüderl and Schüssler, 1990), uncertainty (Schröder, 2008), and owner dependence (Shane and Stuart, 2002). In addition, spin-off companies often rely on highly sophisticated research results and cutting-edge technology. Thus, they are usually established in a very early stage and need to continue developing their technologies and portfolios (Shane, 2004).

According to the introduced definitions, spin-off companies have specific features that differentiate them from new technology-based ventures. First, the transfer of technology or knowledge gathered within the research organisation implies that the mother institution is often involved in the founding process and might even be an additional stakeholder. Second, the transfer of people from the academic to the business environment implies certain characteristics of the entrepreneurial and management team. Former researchers often have a technical background and less commercial or business experience because they have worked in a non-commercial environment and focused on research and publication rather than transfer or commercialisation.

This study focuses on the second aspect. Many entrepreneurial teams lack the managerial and entrepreneurial skills to establish profitable ventures, as the scientists themselves are typically the founders of high technology companies emerging from academia. Ensley and Hmieleski (2005) found that management teams of university-based start-ups tend to be more homogeneous regarding their educational background and their functional and industry experience than other start-ups. This finding is especially true in the early years, when the majority of spin-off entrepreneurs and managers have a technical background (Helm and

Mauroner, 2007). Thus, the composition of the entrepreneurial teams are likely to change over time (Vanaelst, Clarysse et al., 2006) and involve experienced external entrepreneurs and managers who did not belong to the research institutions before joining the spin-offs (Franklin, Wright, and Lockett, 2001).

In this context, Radosevich (1995) identified two types of entrepreneurs and distinguished between the academic and the surrogate entrepreneur. Whereas academic entrepreneurs, also called inventor or technology entrepreneurs, actively participated in developing the technology, the external, or surrogate, entrepreneurs joined the spin-off from outside the research institute (Franklin, Wright, and Lockett, 2001). Most research has focused on the phenomenon of academic entrepreneurs, but only a few studies have studied the role and impact of external entrepreneurs within the executive teams (Mosey and Wright, 2007). There is substantial empirical evidence that the characteristics of the entrepreneurial team have an impact on spin-off success (e.g., Vohora, Wright and Lockett, 2004; Helm and Mauroner, 2007), but the findings are contradictory. For this reason, research must consider both the direct and indirect relationships between team characteristics and performance and examine how team characteristics may influence the internal processes of the organisations.

This need is the starting point of this study, which looks at different facets of academic entrepreneurship and addresses one specific aspect: the effect of executive teams on organisational outcomes. This study explores the effects of resource endowments on organisational outcomes but concentrates on the human capital aspect. In particular, emphasis is placed on the effect of the executives' previous entrepreneurial experiences, an area that is attracting more and more interest among entrepreneurship scholars (e.g., Chandler and Jansen, 1992; Dyke, Fischer, and Reuber, 1992; Westhead, Ucbasaran, and Wright, 2005). In this discussion, an essential differentiation is made between habitual entrepreneurs who have previous business-ownership experience and novice entrepreneurs who are running their business without any prior entrepreneurial experience (Ucbasaran, Alsos et al., 2008). There is a lack of research addressing the extent of habitual entrepreneurship in companies that emerged from academia (Mosey and Wright, 2007).

Furthermore, the findings from previous research concerning the relationship between prior entrepreneurial and business-ownership experience on firm performance are not consistent (e.g., Stuart and Abetti, 1990; Westhead and Wright, 1998). Habitual entrepreneurs do not, by default, perform better than novice entrepreneurs (Ucbasaran, Westhead, and Wright, 2006) simply because they might have been able to enlarge their knowledge and capabilities in prior businesses. They can also adopt routines and mindsets that limit the identification of opportunities and the development of the emerging business in a new and different environment (Starr and Bygrave, 1991). In view of this inconclusive or weak support for a positive impact of previous entrepreneurial experience on firm performance, the

perspective regarding this debate must be broadened. Hambrick and Mason (1984) discuss the relationships between top management characteristics and the strategic decisions of the company as well as the organisational outcomes. Although this framework, called the upper echelons theory, was introduced more in the context of large corporations, applying it in an entrepreneurial setting may add an interesting perspective as it outlines a mediating effect of the characteristics of the management team on firm performance through the team's strategic choices.

In summary, most of the prior research on the entrepreneurial teams of academic spin-offs from research institutes has focused on the inventor as an entrepreneur. The effects of surrogate or habitual entrepreneurs on the development and performance of research-based spin-offs have been mainly analysed qualitatively; thus, further quantitative empirical studies are needed. The theoretical approach of this research stream, which studies performance and potential influence factors, refers primarily to the resource-based view (Barney, 1991). In this context, it must be mentioned that (1) the resource-based view is not really interested in processes, even though they might be effected by the characteristics of the management team and have a potential influence on organisational outcomes, and (2) the resource-based view does not assume that certain experiences, which are considered to be resources, could also be a liability for the company (Cannella, Finkelstein, and Hambrick, 2008). Therefore, the theoretical approach must be extended. The previous discussion leads to the following central research question, which guides the analysis of this study:

Research question:

How do executive teams in research-based spin-off companies influence organisational outcomes?

Because literature on executive teams in research-based spin-off companies is limited, studies with focus on new technology-based ventures and small and young companies were considered as well. In table 2.3, the literature that deals with different aspects of founding, entrepreneurial, and management teams is presented. The overview includes methods, measures, and key findings regarding the direct impact on performance and venture development. While several findings were discussed in this chapter, some references will be addressed in the following chapters.

Table 2.3: Overview of studies on entrepreneurial and management teams

No.	Authors	Topic	Sample	Data	Analysis	Context	Measures	Main findings
1	Amason, Shrader, and Tompson (2006)	Top management team characteristics and new venture performance	174 new ventures	Archival data (longitudinal)	Hierarchical regression	US	Sales growth, profitability, stock market returns	Novelty interacts with characteristics of top management team and affects performance. Interaction of novelty and diversity is positively associated with performance.
2	Aspelund, Berg-Utby, and Skjevdal (2005)	Initial internal resources as antecedents of survival	80 NTBV	Archival data, follow-up surveys (longitudinal data)	Linear regression	Norway, Sweden	Survival (hazard rate)	Smaller teams and higher degree of diversity increase likelihood of survival.
3	Baron and Ensley (2006)	Opportunity recognition of experienced and novice entrepreneurs	88 experienced, 106 novice entrepreneurs	Questionnaire	Content analysis	US	Business opportunity attributes	Business opportunity prototypes of experienced entrepreneurs are better defined and more related to factors regarding starting and running new venture.
4	Barringer, Jones, and Neubaum (2005)	Characteristics of rapid-growth firms and their founders	50 rapid-growth firms, 50 slow-growth firms	Case studies	Content analysis	US	Rapid growth, slow growth	Founder characteristics and firm attributes are important to generate rapid growth.
5	Bates (1990)	Owner human and financial capital inputs and business longevity	4,429 small firms	Archival data, survey	Multivariate regression, discriminant analyiss	US	Survival, access to debt	Human capital inputs partially cause financial capital inputs. Owner education and financial capital inputs explain company longevity.
6	Batjargal (2007)	Social capital, human capital and performance	94 internet ventures	Telephone interviews	Logistic regression analysis	China	Survival	Interaction of social capital and start-up experience is negatively associated with firm performance.
7	Beckman, Burton, and O'Reilly (2007)	Top management team demographic characteristics and firm outcomes	161 young high-tech firms	Interviews, survey, archival data	Event history analysis, cox proportional hazards models	US	VC-funding, IPO	Functional and affiliation hete-rogeneity are related to positive outcomes. Adding knowledge and experience increases likelihood of VC and IPO.

Table 2.3: Overview of studies on entrepreneurial and management teams (continued)

No.	Authors	Topic	Sample	Data	Analysis	Context	Measures	Main findings
8	Boeker and Karichalil (2002)	Firm and individual characteristics and founder departure	78 young semiconductor firms	Archival data (longitudinal)	Hazard rate model, regression analysis	US	Founder departure	Founder departure is accelerated by firm size, decreases with founder ownership and board membership, and has a U-shaped relationship with firm growth.
9	Boeker and Wiltbank (2005)	Factors influencing changes in the top management of start-ups	86 semi-conductor ventures	Archival data, interviews	Regression analysis	US	Changes in the top management team	Very low or very high firm growth increase changes in top management. VC increases and managerial ownership decreases changes.
10	Bruton and Rubanik (2002)	Resources of the firm and firm growth	45 high-tech firms	Structured interviews	Regression analysis	Russia	Growth (employment)	Larger teams are likely to generate greater resources leading to greater firm performance.
11	Chandler and Hanks (1994)	Moderating effects of founders´ entrepreneurial and managerial competencies	155 manufacturing firms	Questionnaire	Moderated regression analysis	US	Perceived growth: market share, cash flow, sales	Individual competencies moderate relationships between opportunity quality, acces to resources, and firm performance.
12	Chandler and Hanks (1998)	Substitutability of founders´ human and financial capital	102 firms	Questionnaire	Regression analysis	US	Sales/earnings, growth	Human and financial capital are substitutable. Firms with high founder human capital and low financial capital perform like firms with low human capital and great financial capital.
13	Chandler and Jansen (1992)	Founders´ entrepreneurial, managerial, and technical competences and performance	134 firms	Questionnaire	Factor analysis, discriminant analysis	US	Profitability, growth	Successful founders perceive themselves as competent in entrepreneurial, managerial, and technical-functional roles.
14	Chandler, Honig, and Wiklund (2005)	Initial team size, diversity, firm stage, environmental dynamism, and turnover in venture teams	408 new ventures, 124 established firms	Questionnaire	Binary logistic and moderated regression analysis	Sweden, US	Profitability, sales growth	Team size and diversity affects turnover. Departures are increasingly associated with sales growth, additions become increasingly negative.

Table 2.3: Overview of studies on entrepreneurial and management teams (continued)

No.	Authors	Topic	Sample	Data	Analysis	Context	Measures	Main findings
15	Clarysse and Moray (2004)	Spin-off development phases	1 academic spin-off	Single longitudinal case study	Content analysis	Belgium	Entrepreneurial team formation	Entrepreneurial team formation is a process of self-organized punctuated equilibrium.
16	Colombo and Grilli (2005)	Relation between growth and human capital of founders	506 NTBV	Archival data, questionnaire	OLS regression analysis	Italy	Growth (employment)	Education and prior work experience affect growth. Management education, scientific and technical background positively influence growth.
17	Colombo, Delmastro, and Grilli (2004)	Characteristics of founders and initial startup size	391 NTBV	Archival data, questionnaire	Linear regression analysis	Italy	Initial firm size (number of employees)	Founders´ human capital has a positive impact on firms´ initial size. Specific human capital has greater impact than general human capital.
18	Cooper, Gimeno-Gascon, and Woo (1994)	Initial human and financial capital and performance of new ventures	1,053 new ventures	Questionnaire (longitudinal data)	Discriminant analysis, logistic regression	US	Survival, growth	General human capital influences survival and growth. Management know-how has limited effect.
19	Cressy (1996)	Human capital, financial assets, and venture survival	2,000 start-ups	Archival data	Regression analysis	UK	Survival	Individual assets influence survival. Financial capital does not affect survival.
20	Daily and Dalton (1992)	Founder-managed, professional-managed ventures, and financial performance	186 small companies	Archival data, telephone interviews	Univariate/ multivariate regression analysis	US	Price/earnings ratio, return on assets, return on equity	Financial performance of founder-managed and professional-managed firms does not differ significantly.
21	Davidsson and Honig (2003)	Social and human capital and nascent entrepreneurial activities	380/608 individuals	Telephone survey, follow-up interviews (longitudinal data)	Rregression analysis	Sweden	Opportunity discovery/ exploitation, sales, profitability	Human and social capital increases likelihood of becoming nascent entrepreneur, small positive effect on sales and profitability.
22	Dubini (1989)	Entrepreneurial team characteristics and performance	151 ventures	Archival data	Cluster analy-sis, regression analysis	US	Sales volume, profitability	Different entrepreneurial team characteristics predict performance for different clusters.

Table 2.3: Overview of studies on entrepreneurial and management teams (continued)

No.	Authors	Topic	Sample	Data	Analysis	Context	Measures	Main findings
23	Eisenhardt and Schoonhoven (1990)	Founding team, strategy, environment, and growth	92 technical-based semi-conductor ventures	Structured interviews, archival data (longitudinal data)	Multivariate regression analysis	US	Growth (sales)	Main and interaction effects for the founding top-management team and market stage on firm growth, no significant effect of technical innovation on growth.
24	Ensley and Hmieleski (2005)	Top management team composition, dynamics, and performance	102 high-tech university start-ups, 154 NTBV	Questionnaire	Discriminant analysis, multiple regressions	US	Team composition and dynamics, performance	Top management teams of university start-ups are more homogenous and perform lower than independent new ventures.
25	Ensley, Pearson, and Amason (2002)	Top-management interaction and new-venture performance	70 new ventures (Inc. 500)	Questionnaire	Structural equations modelling (LISREL), hierarchical regression	US	Sales growth, profitability	Affective conflict is negatively associated with performance, cohesion is negatively related to affective conflict. Cohesion among the management team is positively related to performance.
26	Ensley, Carland, and Carland (1998)	Entrepreneurial team skill heterogeneity, functional diversity, and new venture performance	88 fast growing firms	Questionnaire	Regression analysis	US	Revenues, sales growth, profitability	Team heterogeneity is negatively related to growth, diversity and functional background are negatively related to revenue.
27	Florin, Lubatkin, and Schulze (2003)	Influence of human and social capital on venture funding and performance	275 IPO firms	Archival data	Moderated regression analysis	US	Accumulated financial capital, sales growth, return on sales	Links between human resources and performance and between financial capital and resources vary with the level of social resources.
28	Gimeno, Folta et al. (1997)	Entrepreneurial human capital and performance and persistence	1,547 entrepreneurs of new businesses	Questionnaire	Censored regression, grouped data regression	US	Exit from business, economic performance	Specific human capital influences performance and survival, general human capital influences performance more than survival.
29	He (2008)	Performance of firms with founder-CEOs and professional CEOs	1,143 IPO firms	Archival data (longitudinal)	OLS regression analysis, fixed effects model	US	Return on assets ratio, survival	Founder-CEOs perform better than professional managers.

Table 2.3: Overview of studies on entrepreneurial and management teams (continued)

No.	Authors	Topic	Sample	Data	Analysis	Context	Measures	Main findings
30	Hitt, Biermant et al. (2001)	Direct and moderating effects of human capital on strategy and performance	93 professional services firms	Archival data, interviews	Regression analysis	US	Profitability	Human capital has curvilinear effect on performance. Human capital moderates links between strategy and firm performance.
31	Hsu (2007)	Prior start-up founding experience, organizational capital, and venture capital funding	149 early stage technology-based start-up firms	Survey	Multivariate regression analysis	US	Venture capital funding, venture valuation	Prior founding experience increases the likelihood of VC-funding and venture valuation. Fonders´ ability to recruit executives is positively associated with venture valuation.
32	Knockaert, Ucbasaran et al. (2011)	Management team composition, knowledge transfer and performance	9 spin-offs	Case studies	Content analysis	Belgium		Tacit knowledge is most effectively transferred to the new company if researchers join the spin-off team
33	Kulicke (1985)	Factors influencing growth phase	83 NTBV with 16 spin-offs	Survey	Descriptive analysis	Germany	Growth in sales and employees	Lack of professional experience inhibits growth.
34	Macmillan, Siegel, and Narasimha (1985)	Evaluation criteria for venture capitalists	100 venture capitalists	Questionnaire	Factor analysis, cluster analysis	US	Funding decision	Quality of the entrepreneur determines the funding decision.
35	Montgomery, Johnson, and Faisal (2005)	Human capital, financial capital, and business success	1,506 persons	Archival data	Regression analysis	US	Survival, revenues, earnings	Human capital increases the probability of self-employment, but not the likelihood of success.
36	Preisendorfer, and Voss (1990)	Entrepreneurial age, human capital and survival	78,441 small traders	Archival data	Bivariate analysis, multivariate analysis	West Germany	Survival	Concave relationship between founder age and organisational mortality. Human capital is more relevant in branches where industry experience is required.
37	Radosevich (1995)	Surrogate entrepre-neurs in spin-offs	3 spin-offs	Case studies	Content analysis	US		Surrogate entrepreneurs can help to commercialise technology.

Table 2.3: Overview of studies on entrepreneurial and management teams (continued)

No.	Authors	Topic	Sample	Data	Analysis	Context	Measures	Main findings
38	Roberts (1991)	Success factors of spin-offs and NTBV	Several studies, e.g., 156 MIT spin-offs, 82 non-MIT spin-offs	Survey, case studies	Descriptive analysis	US	Sales growth, survival, profitability	Business experience of founders is positively related to early growth. Diversity of human capital is associated with performance.
39	Robinson and Sexton (1994)	Education, experience and self-employment success	21,352 self-employed people	Archival data	Probit regression analysis	US	Earnings potential	General education has a strong positive effect on self-employment success. Experience has a postive but small effect.
40	Roure and Keeley (1990)	Influence of management, firm´s strategy and environment	36 NTBV	Archival data	Multivariate linear regression	US	Internal rate of return	Complete management team has positive influence on success.
41	Samsom and Gurdon (1993)	University scientists as entrepreneurs	22 high-tech ventures	Case studies	Descriptive analysis	US		Conflicts between business and scientific cultures constrain team work. Researchers consider lack of management skills as hurdle for success.
42	Shane and Stuart (2002)	Social capital of company founders	134 MIT-spin-offs	Archival data	Multivariate regression	US	VC financing, IPO, failure	Founders with relationships to venture investors are most likely to receive venture funding. VC-funding increases the likelihood of an IPO.
43	Shrader and Siegel (2007)	Human capital and firm performance	198 high-tech firms	Archival	Regression analysis	US	Profitability, sales growth	Strong link between team experience and strategy, fit between team experience and strategy determines long-term performance.
44	Steinkühler (1994)	Incubator centres and success of spin-offs	34 spin-offs, 35 NTBV		Bivariate, factor, and path analysis	Germany	Growth, productivity, profitability	Founders´ industry experience and qualification is positively associated with growth.

Table 2.3: Overview of studies on entrepreneurial and management teams (continued)

No.	Authors	Topic	Sample	Data	Analysis	Context	Measures	Main findings
45	Stuart and Abetti (1990)	Entrepreneurial and management experience and early performance	52 NTBV	Questionnaire	Factor analysis, linear regression	US	Growth, profitability, productivity	Advanced education beyond bachelor is negatively, entrepreneurial experience is positively related to performance.
46	Ucbasaran, Westhead, and Wright (2009)	Entrepreneurs´ prior business ownership experience and opportunity identification	630 entrepreneurs	Questionnaire	Probit analysis, binomial regression	UK	Opportunity identification, innovativeness	Business ownership experience positively affects identification of business opportunities and innovation.
47	Vanaelst, Clarysse et al. (2006)	Team heterogeneity in different phases of the spin-off process	10 academic spin-offs	Questionnaire, interviews, case studies	Content analysis	Nether-lands	Team development (heterogeneity)	Teams evolve over time and change composition. Team´s diversity changes in different stages of the spin-off process.
48	Virany and Tushman (1986)	Changes in top-management teams	59 technical based ventures	Archivial data, Interviews	Descriptive analysis	US	Return on assets	Executive succession is important for adopting to environmental challenges.
49	Vohora, Wright, and Lockett (2004)	Development of spin-offs	9 university spin-offs	Case studies	Content analysis	UK		General human capital positively influences spin-off performance.
50	Weinzimmer (1997)	Team heterogeneity, size, age of team members	74 firms		Correlation analysis		Sales growth	Functional heterogeneity, team size, and average age of team members are positively related to performance.
51	Wright, Vohora, and Lockett (2004)	Joint ventures and venture capital investors	4 spin-outs	Case studies	Descriptive analysis	UK	Business development	Joint venture spin-outs commercialise faster, more flexible, and less risky than venture backed university start-ups.
52	Zucker, Darby, and Armstrong (2002)	Publication and patents records and performance	112 "star" scientists	Survey	Multiple regression	US	Number of patents and citations	Number of academic publications is positively related to firm performance.

http://www.springer.com/978-3-658-01214-4

Executive Teams in Research-Based Spin-Off Companies
An Empirical Analysis of Executive Team Characteristics, Strategy, and Performance

Tietz, R.

2013, XVII, 296 p. 24 illus., Softcover
ISBN: 978-3-658-01214-4