

DEPARTMENT OF ENVIRONMENT,
TECHNOLOGY AND TECHNOLOGY MANAGEMENT

**Research valorisation through spin-off ventures:
Integration of existing concepts and typologies**

Sven De Cleyn & Johan Braet

**UNIVERSITY OF ANTWERP
Faculty of Applied Economics**



Stadscampus
Prinsstraat 13, B.213
BE-2000 Antwerpen
Tel. +32 (0)3 220 40 32
Fax +32 (0)3 220 47 99
<http://www.ua.ac.be/tew>

FACULTY OF APPLIED ECONOMICS

DEPARTMENT OF ENVIRONMENT,
TECHNOLOGY AND TECHNOLOGY MANAGEMENT

Research valorisation through spin-off ventures: Integration of existing concepts and typologies

Sven De Cleyn & Johan Braet

RESEARCH PAPER 2007-008
MAY 2007

University of Antwerp, City Campus, Prinsstraat 13, B-2000 Antwerp, Belgium
Research Administration – room B.213
phone: (32) 3 220 40 32
fax: (32) 3 220 47 99
e-mail: joeri.nys@ua.ac.be

The papers can be also found at our website:
www.ua.ac.be/tew
(research > working papers)

D/2007/1169/008



FACULTY OF APPLIED ECONOMICS

DEPARTMENT OF ENVIRONMENT, TECHNOLOGY
AND TECHNOLOGY MANAGEMENT

Research valorisation through spin-off ventures:
Integration of existing concepts and typologies

***Sven De Cleyn
Johan Braet***

2007

University of Antwerp
Prinsstraat 13
B-2000 Antwerp
BELGIUM

E-mail: johan.braet@ua.ac.be
sven.decleyn@ua.ac.be

ABSTRACT

The research domain of innovation and entrepreneurship is relatively young and fragmented. Therefore, no consensus exists on the definition of the main concepts. This paper intends to both elucidate (the differences between) the concepts of ‘spin-off’ and ‘spin-out’ and, starting from existing literature typologies, to integrate several existing spin-off taxonomies, classifications and typologies in order to create a clear and complete framework for further research. This way, 10 different ‘ideal’ spin-off and spin-out types will be defined. The resulting integrated typology will be illustrated in view of its practical and theoretical implications.

KEYWORDS

Spin-off; Spin-out; Taxonomy; Integrated typology; Entrepreneurship; Technology transfer

1. Introduction

The increased attention for valorisation of research results and innovation has been mirrored in the rising number of scientific publications and research projects on this subject. The relatively young research field of entrepreneurship, innovation and spin-off companies struggles, comparable to every rather recent field, with a lack of comparability and a scattered landscape of definitions, concepts and taxonomies. Firstly, for example, the concept of the ‘spin-off company’ has several synonyms. Different studies on this subject denominate the same concept as ‘spin-off’, ‘spin-out’, ‘science-based spin-off’, ‘new technology based firm’, ‘research-based venture’ or ‘high-tech starter’ (e.g. Aaboen et al. (2006); Aspelund et al. (2005); Dahlstrand, 1997; Di Gregorio and Shane (2003); Feldman and Klofsten (2000); Jagersma and van Gorp (2003); Kakati (2003); Kazanjian (1988); Lockett et al. (2005); Meyer (2003); Mustar et al. (2006); O’Shea et al. (2004); Parhankangas and Arenius (2003); Vohora et al. (2004) and many others). In addition, there is not at all a consensus about how to define the concept unambiguously. The research field needs clear delimitation of each concept. The scattered landscape is characteristic for the struggle for identity, but is harming the transparency, credibility and reproducibility of the different studies. The accumulation of knowledge is therefore difficult.

Secondly, different studies have recognised the previous problem in the sense that they have tried not only to provide a clear and complete definition of the spin-off concept (Dahlstrand, 1997; Carayannis et al., 1998; Steffensen et al., 1999; Elfring and Foss, 2000; Klofsten and Jones-Evans, 2000; Clarysse and Moray, 2004; Hindle and Yencken, 2004; De Coster and Butler, 2005). They have also suggested a taxonomy of spin-offs, in order to enhance the reproducibility of the studies on this subject. However, most of these taxonomies and typologies elaborate the concept only partially. The spin-off world has a dual structure, as spin-off companies can

either originate from academic research institutions or from business organisations. Most of the preceding studies focussed on one of both aspects. However, both subject areas contain several similarities and share structures. Therefore, an integrated view could offer new and useful insights as a basis for further research in this domain.

This need for an integrated typology has previously been expressed by Mustar (2000):

“... One cannot speak of USOs (University Spin-Offs) as new business venturing by researchers... We must stop considering USOs as a single and homogeneous phenomenon... It is time to capitalize on the scattered empirical evidence accumulated for more than twenty years and integrate them into a common typology which should be relevant for both scholars and practitioners...” (Mustar, 2000)

In order to address the issues outlined previously, this article has the intention to present an integrated typology of spin-off companies in order to enhance the credibility, comparability and reproducibility of studies in the research domain. The remainder of the article will be structured towards this integration. Firstly, the concept of spin-off will be elaborated and defined unambiguously. Connected to defining the concept, we will draw the distinction between spin-offs and spin-outs. Secondly, the attention will be drawn towards the taxonomy and typology of spin-offs, starting with the focus on existing literature on this subject. A debate on some theoretical dimensions, largely determining the future of a new venture, will shed light on the organisational attributes that distinguish different ‘ideal’ types of spin-off and spin-outs from each other (Doty and Glick, 1994). Afterwards, we will present an integrated view on several spin-off and spin-out types. Before a final conclusion, the potential advances of the presented integrated typology for both theory and practice will be discussed.

2. Definition of the concept

Different authors have tried to present a definition of a spin-off company. Appendix 1 provides an overview of some of definitions of the spin-off and spin-out concept, illustrating the scattered definitional landscape. Perhaps one of the most widespread definitions has been advanced 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.”

However, this definition exclusively focuses on companies arising from academia. Common shortcomings of some other definitions concern the exaggerated attention for technological knowledge, whereas any kind of knowledge can be involved, and the non-mentioning of the potential transfer of staff. Therefore, we propose a new definition, covering the most important and common elements of a spin-off company:

“A spin-off is (1) a new legal entity (company) (2) founded by one or more individuals seconded or transferred (sometimes part-time) from a parent

Research valorisation through spin-off ventures

organisation (3) to exploit some kind of knowledge (4) gained in the parent organisation and transferred to the new company.”

We will shortly discuss the main elements of this definition.

- **New company**

A spin-off has to be a new company (legal entity). Existing companies changing their statutes, legal form or whatever can not be categorised as spin-off.

- **Parent organisation**

The nature of the parent organisation does not matter. Spin-offs and spin-outs in general can arise from industry, academia and non-profit. The origin of a spin-off company will draw a distinction during analysis of possible taxonomies.

Often, people leave the parent organisation to form the nucleus of the new venture (Bell and McNamara, 1991; Feldman and Klofsten, 2000; Goldfarb and Henrekson, 2003). The characteristics of the staff transfer may vary from part- to full-time. However, the transfer is often temporarily or the researcher-founder stays part-time at the parent organisation.

- **Exploitation of knowledge**

Exploitation of the transferred knowledge is a key element in the definition of a spin-off. The nature of the knowledge is not of matter. Patents, product innovations, process innovations or scientific, technical and market know-how are all part of the (non-exhaustive) list of transferable knowledge (Trott, 1998).

- **Transfer**

Knowledge transfer can be done in several ways. Founding spin-off companies is just one possibility to transfer knowledge to the market. Licensing, joint ventures and other can be addressed as other ways to find the way to the market. The specific characteristics of the knowledge transfer from the parent organisation to the spin-off venture – whether definitive and exclusive or not, whether complete or partial – are irrelevant to make a distinction between spin-off companies and other companies.

What is pivotal, is the transfer of knowledge, not the *modus operandi*. The transfer from the parent organisation to the spin-off can take the form of a licensing agreement, an intellectual property sale or a contribution as intangible assets in exchange for shares (Goldfarb and Henrekson, 2003; Grimaldi and Grandi, 2005; Markman et al., 2005).

As discussed earlier in this paper, some related concepts are used alternately, often to indicate the same phenomenon. According to us, there is however a clear distinction between the ‘spin-off’ and the ‘spin-out’ concept. In our view, a spin-off is the creation of a completely new entity outside an existing organisation, whereas a spin-out concerns the separation of an existing entity (division, business unit etc.) from the mother organisation. Therefore, both concepts should be seen as separate phenomena. However, spin-offs and spin-outs stay related, as they have multiple similar characteristics. For both types, transfer of staff and knowledge are involved. In

Research valorisation through spin-off ventures

addition, the ultimate goal of the establishment – create economic value through the commercial exploitation of knowledge – is shared by spin-offs and spin-outs. As a result, we present a definition of a spin-out company, which has common ground with the spin-off definition presented earlier.

“A spin-out is (1) an existing entity (2) being separated from a parent organisation as a new legal entity (company) (3) to exploit some kind of knowledge (4) gained in the parent organisation and transferred to the new company.”

Again, we will shortly discuss the main elements of this definition.

- **Existing entity**

Contrary to the spin-off concept, spin-outs are existing entities within their parent organisations. When the parent organisation decides to separate the entity as a legally independent entity *out* of its own structure, it is called a spin-out.

- **Parent organisation**

In our integrated typology, spin-outs are a phenomenon uniquely attributed to the corporate world. Indeed, academic divisions or department will not be separated as commercially and legally independent entity.

- **Exploitation of knowledge**

Again, the exploitation of the transferred knowledge is a key element in the definition of a spin-out. Similar to the spin-off situation, patents, product innovations, process innovations or scientific, technical and market know-how are all part of the (non-exhaustive) list of transferable knowledge (Trott, 1998). Often, spin-out can take advantage of substantial expertise and intangible assets (know-how, tools and instruments, etc.), gained in the parent company.

- **Transfer**

The transfer of knowledge in spin-outs occurs in a similar way to the transfer in spin-off ventures. What is pivotal, is the transfer of knowledge, not the *modus operandi*. The transfer from the parent organisation to the spin-out can take the form of a licensing agreement, an intellectual property sale or a contribution as intangible assets in exchange for shares (Goldfarb and Henrekson, 2003; Grimaldi and Grandi, 2005; Markman et al., 2005).

The distinction drawn between spin-off and spin-out companies will be used in the remainder of the article and can be useful to streamline the research domain.

3. Towards an integrated typology of spin-offs and spin-outs

In this part, we will start with an overview of some existing literature taxonomies in order to demonstrate the diversity and fragmentation. Most taxonomies only treat spin-off and spin-out companies arising from academia or from industry. Seldom, both worlds are combined. Therefore, we will work towards an integrated typology,

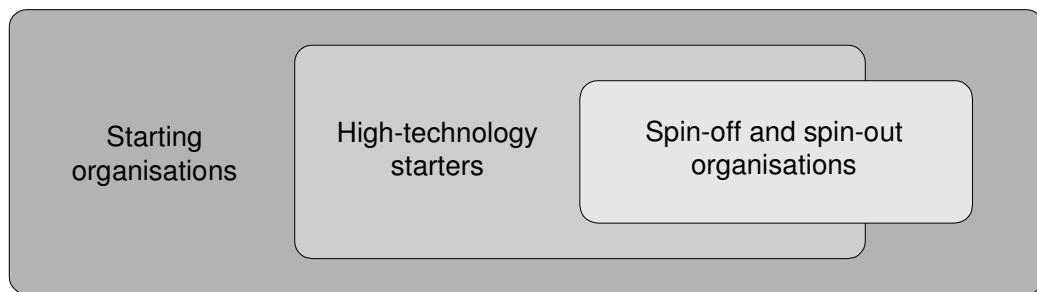
combining the insights of several literature characterisations with insights from our own experiences. As Doty and Glick (1994) suggest, the difference between a taxonomy (or classification) and a typology lies in its theory-building intention. A taxonomy refers to “*classification systems that categorize phenomena into mutually exclusive and exhaustive sets with a series of discrete decision rules*” (Doty and Glick, 1994, p.232). In contrast, a typology refers to “*conceptually derived interrelated sets of ideal types*” (Doty and Glick, 1994, p.232), defining organisational forms that *might* exist rather than existing organisation types. Starting in section 3.2, we develop theoretical dimensions influencing the possible outcome of an organisational form. In section 3.3, we will discuss a set of 10 potential forms of spin-off and spin-out ventures. In line with the view of Doty and Glick (1994), we therefore rather develop a typology than a pure classification scheme.

3.1. Existing literature

Before starting the exploration and elaboration of spin-off taxonomies, we paint a picture of the broader context where spin-off companies operate. The analysis of de Jong et al. (2003) can be used as starting point. Figure 1 gives a slightly adapted view. In the pool of starting organizations, the high-technology starters comprise a small part with specific characteristics. The largest proportion of the spin-off companies operates in a high-technology context (at least, this perception exists). However, spin-offs can equally well operate outside the high-tech environment.

Figure 1.

Context of spin-off organisations.



Reference:

Figure adapted from: de Jong, J. P. J., Overweel, M. J., Janszen, F. H. A., 2003. Hightech starters: Waarheden en mythes. EIM Business & Policy Research, Zoetermeer (the Netherlands).

On of the most complete existing taxonomies has been presented by Yencken (2002). Based on criteria identified and developed by Thorburn (1997) and Upstill and Symington (1999), Yencken identifies 4 categories of spin-off companies:

- *Direct research spin-offs* are created to valorise and commercialise Intellectual Property of a parent organisation. Staff may be transferred as well.

Research valorisation through spin-off ventures

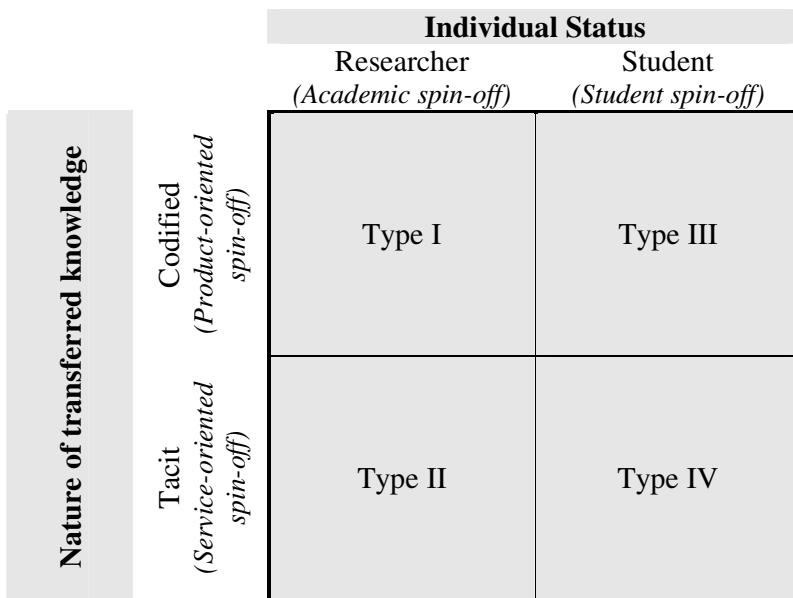
- *Technology transfer companies* are created to valorise university tacit knowledge (often no IP involvement).
- *Indirect spin-off companies* are created by former staff or students with the experience acquired during the stay at university, without formal IP licensing or similar relationships.
- *(Corporate) Spin-outs* are founded out of existing business companies.

This classification will prove useful for the elaboration of the integrated typology, as presented under section 3.2. The taxonomy of Yencken (as adopted and taken over by Yencken, Cole and Gillin (2002)) is one of the few addressing both university and corporate spin-off ventures. However, the concept of corporate spin-outs has not been further elaborated by Yencken.

The view of Yencken can be superposed by the insight of Dahlstrand (1997), which divides the spin-off companies in 2 separate categories: university spin-offs versus corporate spin-offs. This way, the first 3 groups of spin-offs as identified by Yencken can be unified in 1 category. This basic division will be used for the construction of the integrated typology. The combination of the knowledge gained by Yencken and Dahlstrand will further shape the basis of our own typology. The division of spin-off ventures in several categories will be based on both the origin of the organisation (university versus commercial enterprise) and the reason for start-up.

Figure 2.

A taxonomy of university spin-offs.



Reference:

Pirnay, F., Surlemont, B., Nlemvo, F., 2003. Toward a typology of university spin-offs. *Small Business Economics* 21, 361.

More recently, Pirnay et al. (2003) presented a two-dimensional taxonomy of university spin-offs, based on the nature of the transferred knowledge and the individual status of the founder. This way, the taxonomy gives birth to 4 different types of spin-off companies (as presented in Figure 2). The distinction between tacit knowledge (mostly service-oriented spin-offs) and codified knowledge (predominantly product-oriented spin-offs) is of course not absolute. Most contemporary companies combine product and service offerings. The total solution concept has only increased this mixture in the offerings.

The taxonomy of Pirnay is based on the more complex, 3-dimensional taxonomy as presented in the PhD dissertation of the same author (Pirnay, 2001). As a result of a third dimension (the supporting versus unfavourable attitude of the mother university), 8 types of academic spin-offs are identified.

The previous taxonomies clearly had a predominant focus on spin-off companies originating out of the academic research context. However, the number of articles focusing on spin-offs from existing commercial organisations is very limited. Recently, Parhankangas and Arenius (2003) completed a large-scale study on this specific category of spin-off ventures. The results indicated 3 different clusters of corporate spin-off companies:

- *The new technology group.* This type of spin-offs is basically created to explore a new technological domain, independently of the mother organisation. The goal is however to reintegrate the spin-off in the mother organisation once the technology has reached a more mature status. This type of spin-off has basically been identified by Stankiewicz (1994).
- *The new market group.* The basic idea is that both the parent company and the spin-off share the same technology base. However, they both serve different markets. The unwillingness to support diversification into the new markets is the core argument for the formation of the start-up company.
- *The restructuring group.* The spin-offs in this category are formed by old but existing business units of the parent organisation. Once, the activities and the technology and customer base of the spin-off were closely related to those of the parent. The goal is to focus on the core competences of the parent firm and to reassure the long-term performance.

This overview of existing taxonomies and classifications is far from being complete or all-embracing. Other classifications can be found in different contributions of scientific literature (e.g. Bhidé, 2000; Stankiewicz, 1994). The combination of all these insights will form the basis of the integrated typology as presented in the next section. Both the university spin-offs and the corporate spin-offs and spin-outs will be elaborated in more detail. Some of the previous literature insights will be combined with new concept to form in order to provide an integrated and complete view on the diverse landscape of spin-off companies.

3.2. Distinguishing dimensions

The integrated typology, as presented under section 3.3, is based on 5 discriminating dimensions (Doty and Glick (1994) refer to it as constructs). These dimensions,

Research valorisation through spin-off ventures

however theoretical, have been grounded in practical and day-to-day business considerations. The different ideal types of spin-offs and spin-outs have been identified according to specific values for each dimension. Therefore, the typology is actionable for both researchers and practitioners. Each of these distinguishing dimensions will be addressed in this section. An overview of the different ideal types with their specific characteristics will be presented in Table 1 (Section 3.4).

Origin A first distinguishing characteristic of spin-off and spin-out companies is their origin. As discussed earlier in this article, new venture ideas based on research results used to be commercialised by existing corporations through the formation of new companies. However, since the last decades of the 20th century, academic organisation started to foster entrepreneurship within their walls (Bray and Lee, 2000; Chiesa and Piccaluga, 2000; Degroef, 2003; Lockett et al., 2005). Especially for the academic spin-off companies, the reputation of the parent company can be crucial to its survival, as the credibility of the ventures increases dramatically in the eyes of the market (Davidsson and Klofsten, 2003).

Founder The type of founder is of larger importance in case of an academic venture. The distinction has to be drawn between student spin-off ventures and academic researcher spin-offs. The difference is important as students mostly do not have access to all university resources at all (Pirnay et al., 2003), while academic staff member can often benefit of infrastructure, advice and other resources. In the last decades, many universities and other research organisations have installed policies and structures to provide this aid systematically (Chiesa and Piccaluga, 2000; Lockett et al., 2005). As students often do not have access to it, most new ventures founded by students never appear in any record (Wallmark, 1997; Aguirre et al., 2006). More generally, spin-off and spin-out ventures can be founded by both staff and management members. Actually, the type of founder does not matter significantly, except in academic environments (as discussed above). Any member of an organisation can decide to seize a (perceived) opportunity.

Driver An important dimension relates to the driver or reason for spinning off or out a venture. In the academic environment, researchers or staff members generally do not aspire to become entrepreneur themselves. Rather, they prefer to publish research results in scientific journals (Agrawal and Henderson, 2002; Chiesa and Piccaluga, 2000). Of course, some exceptions can be found. When they do, they are often driven by personal motivations. The same holds for students starting a spin-off venture. These ventures are rather the result of perceived personal opportunities rather than of institutional policies searching for commercialisation opportunities. Opposed to this view, many universities and other academic organisations have installed commissions and policies in order to detect valorisation possibilities of research results and tacit knowledge (Bray and Lee, 2000; Degroef, 2003; Di Gregorio and Shane, 2003; Lockett et al., 2005). The spin-off ventures based on the in-house search for commercialisation opportunities can be seen as the result of the institutional policy of the organisation.

Other drivers, especially in commercial organisations, include strategic and opportunistic reasons. Rather recently, larger corporations explore new and promising technology fields in a setting external to their rigid and perhaps bureaucratic environment. This exploration betters occurs in a less formalised, more dynamic environment (Daft, 2004; Trott, 1998). A second reason to found a separate entity is

because of arising opportunities that occur out of the scope of the actual focus of the organisation. The pursuit of these opportunities would otherwise tend to expand the organisation beyond its optimal scope and would therefore be rather value destroying (Bebchuk et al., 2000).

A last set of drivers relates more to reorganisation of an existing entity. These reorganisations are initiated by 2 causes: entities might have a similar technology base but serve completely different markets or they might fall beyond the strategic scope of the organisation. Both reasons can lead to the spinning out of the entity.

The authors suggest that the manifestation of this driver often relates strongly to the support provided by the mother organisation. It is logic that new venture ideas pursued after personal motivations rather than after institutional policy or strategic intentions, are less strongly supported by the mother organisation. The benefits for the mother organisations would indeed be smaller.

History The history of the entity that serves as a basis for the spin-off or spin-out is of crucial importance in our conceptualisation. According the author's view, a spin-off is the creation of a new entity. In contrast, a spin-out is the ejection or separation of an existing entity *out of* an organisation. In the case of a commercial organisation, a business unit can be spun-out to form a separate stand-alone legal entity. For academic organisation, existing laboratories with commercial activities can sometimes be spun-out due to external pressure, as the activities are judged as unfair competition.

Nature of transferred knowledge A last distinguishing dimension concerns the nature of the transferred knowledge. The main distinction is dichotomy between codified and intangible (or tacit) knowledge (Chiesa and Piccaluga, 2000). Obviously, the knowledge transfer is often not black or white. Mostly, a mix of both types will be transferred from the mother organisation to the spin-off or spin-out venture. In most cases however, the focus will rely on one of both types. In more product-oriented ventures, the main transfer will contain codified knowledge, while service-oriented ventures will rather stress knowledge. This simplification is not always reflected in reality, but represents the large majority of the cases.

The authors suggest that these dimensions or constructs (Doty and Glick, 1994) as an initial configuration of the venture influence the future performances of the venture. For example, a previous track record of an entity (history), gives the spin-out company a head start, compared to entirely new companies. Previous research and other activities have enhanced the experience and initiated the company to pass through the learning curve. Another example can rely in the origin of a venture. Some scientific institutions have built up enormous credibility in the industrial world as leading research institutions. Spin-offs arising from these universities could possibly gain more easily access to required resources such as finance. These examples suggest that the manifestations of the spin-offs' and spin-outs' underlying dimensions could have an impact on future performance and survival chances of the venture.

3.3. Integrated typology

In the literature on spin-off ventures, there is lack of an integrated view on the different kinds of companies. As the previous sections show, much research has been

Research valorisation through spin-off ventures

done on several sub-domains. Mostly, an article treats spin-off organisations resulting from the academic world or spin-offs from existing commercial organisations. However, integration of both ‘worlds’ is rare. Therefore, we have developed an integrated typology of the spin-off concept, comprising both academic and corporate spin-offs. The insights are gained both out of the existing literature and through practical experience. The integrated typology is presented in Figure 3.

Basically, the classification has occurred alongside 2 dimensions. The first dimension (the darkest grey) makes the distinction between spin-off companies resulting from the academic research world (universities, high schools, technical high schools etc.) and those arising from existing business companies. In the second layer, the differentiation occurs based on the originator of the spin-off process. For academic spin-off companies, the distinction is made between academic researchers and students starting the spin-off. For corporate spin-offs, the classification is based on the distinction between spin-offs started by employees (or managers) who see an opportunity and spin-offs started for managerial and strategic reasons.

Specifically for the corporate spin-off companies, we made an extra distinction. Some spin-off companies already existed, mostly as a separate business unit, within the parent company. Therefore, we consider them rather as spin-out (spinning out an existing part) than as spin-off (which we understand as the creation of something new out of the existing parent). Type VII, Type VIII and Type X companies are therefore grouped separately under the term ‘spin-out’, where the other spin-off types remain under the ‘spin-off’ concept.

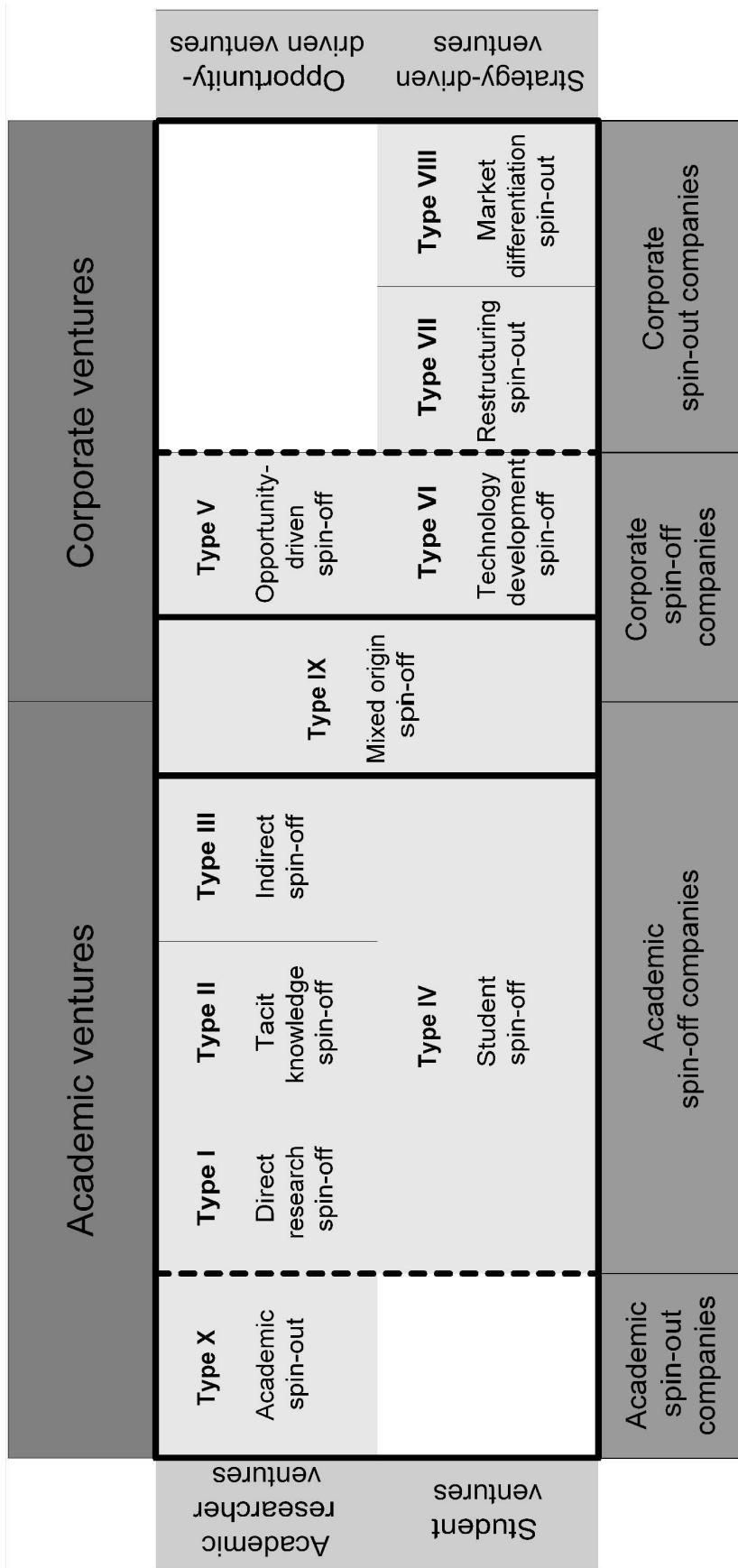
Each of the different types of spin-off ventures will be discussed in more detail in the remainder of this section. We will draw the attention on general characteristics of each type and highlight the factors differentiating them from other types of spin-offs. It should be noted that the presented types or rather ‘ideal’ types. Existing spin-offs and spin-outs will seldom fit these profiles exactly. For example, a student spin-off company will be modelled as being primarily service-oriented. However, student spin-offs can be imagined with a focus on product development.

3.3.1. Type I – Direct research spin-off

This first type of spin-off companies is probably the most recognisable and most known. The direct research spin-offs originate from existing academic institutions in order to commercialise research results (Yencken et al., 2002). They are newly created ventures, organised around a core idea developed inside the mother organisation. The most typifying characteristic is the formal transfer of knowledge (Ndanza et al., 2002). In the majority of the cases, this transfer includes the transfer in any form of Intellectual Property Rights (IPR). This can happen through a sale of the IPR or through licenses (whether exclusive or not) for royalties (Trott, 1998). The spin-offs in this category are predominantly product-oriented (Pirnay et al., 2003). Often, the venture idea is technology-oriented rather than originating from an explicit market demand. This technology-push base is potentially harmful for the competitive position of the spin-off in a demanding market environment.

Research valorisation through spin-off ventures

Figure 3.
Integrated typology



Next to the formal transfer of intellectual property, the parent organisation often supports the formation of the spin-off company in several ways (Grimaldi and Grandi, 2005). Through incubators or technology transfer offices, the parent research institution can provide financing, business advice, networks, housing and research facilities (Grimaldi and Grandi, 2005; Ndonzuau et al., 2002). In a lot of cases, transfer of staff (full or part-time; researchers or other staff members) takes place as well.

The support from and links with the parent research organisation can prove to be of crucial importance for the development of the spin-off. In the first place, the spin-off has (access to) more resources in its early stages than a completely new private company. Its survival chances could therefore increase substantially. Secondly, the network and reputation of the research institution can enhance the legitimacy (Davidsson and Klofsten, 2003).

3.3.2. Type II – Tacit knowledge spin-off

Tacit knowledge spin-off companies share several characteristics with direct research spin-offs. Both companies are created, as new ventures, out of and with support from the parent research institution. The advantages concerning survival chances and increased access to resources concern both types. The founder of the tacit knowledge spin-off company is a (former) staff member or researcher at the founding university. He (or she) gained his experience during his stay at the mother organisation and starts the company as he has perceived an interesting opportunity, which is recognised by the institution, to valorise his knowledge and experience. Transfer of (other) staff is also common.

The distinguishing characteristic is however that for tacit knowledge spin-offs there is no formal transfer of Intellectual Property Rights. Logically, this transfer is impossible, as the transferred knowledge or know-how is tacit. Most of these spin-offs focus – not surprisingly – on providing services (Pirnay et al., 2003). Therefore, the success often depends on the quality of the staff. Investments in machinery and equipment are usually low, but training and education expenses for the personnel are usually high.

3.3.3. Type III – Indirect spin-off

Indirect spin-off companies originate out of universities or other academic organisations. The main characteristic is their independent development. Academic researchers might start their own company, based on knowledge and experience gained during their stay at the research institution. The founder develops his start-up plan without any help of the parent organisation. Their primary driver is the pursuit of a perceived personal opportunity, which is not recognised as such by the mother organisation. Often, the development occurs even unbeknown to the parent organisation. In indirect spin-offs, no formal cooperation or support is provided by the parent company neither is there a formal transfer of knowledge. Degroof (2000) refers to this type of spin-off as “virtual spin-off”, as they often serve other goals

Research valorisation through spin-off ventures

(legal cocoon to provide services and consultancy or to enhance the possibilities to acquire external research funds) than to transfer knowledge towards the industry.

Besides the informal transfer of knowledge and experience (predominantly intangible knowledge), it is not uncommon that the academic staff member or researcher retains his or her function at the research institution. The combination of both functions (researcher and manager / entrepreneur) often requires the approval of the academic authorities. It is often only at this point in the evolution of the spin-off that the creation of the new venture becomes visible for the mother organisation.

3.3.4. Type IV – Student spin-off

Student spin-off companies are often not recognised as spin-off. However, these companies, created by former or present student of an academic institution, are based on ideas and knowledge gained during the courses (Ndonzuau et al., 2002). Often, no formal research is involved. As a logical consequence, the majority of student spin-off ventures focus on delivering services. The growing attention of academic institutions for innovation and entrepreneurship is multiplies the opportunities perceived by students.

Most of the times, the students receive in no formal way support of the ‘parent’ organisation, as they are not aware of the existence of the idea (Ndonzuau et al., 2002). If support is present, the main goal is to accompany student in their search for profitability. The primary focus of potential support mechanisms is however not on the creation of economic value (Pirnay et al., 2003). It is often difficult to map out the population of student spin-off companies, as they have never been recognised as such (Pirnay, 2001).

3.3.5. Type V – Opportunity-driven spin-off

The first type of spin-offs originating from existing business companies are the opportunity-driven spin-offs. In every layer of a company, opportunities can be recognised by anyone with an entrepreneurial reflex. These opportunities are seldom originated out of strategic necessity or managerial considerations. Often, these ideas are not seen as opportunities by the management or, if they are, the spin-off will be the result of non-interest. Therefore, the formation of the spin-off will not be supported by the parent organisation, neither financially or materially. The idea also has no track record within the company.

The founder of the opportunity-driven spin-off can therefore be anyone (single person or group) from every layer of an existing organisation. Often, the spin-off starts in a new, somewhat (but not closely) related domain. However, the spin-off might become a competitor of the parent organisation in the further future. It can equally well be that the spin-off travels a complete different path.

The opportunity-driven spin-off share several characteristics with student spin-off ventures. The absence of support and (often) recognition is the most visible parallel. Additionally, student spin-offs are often initiated by product or service ideas gained

Research valorisation through spin-off ventures

during the stay of the founder at the university. In a parallel way, the basic idea for the opportunity-driven spin-off is formed during the employment at the ‘mother’ company. (The concept of mother company can not really be applied in this situation, as there is mostly no formal recognition or support. Maybe the term ‘nurturing’ company reflects the reality in a more precise and accurate way).

3.3.6. Type VI – Technology development spin-off

The technology development spin-off contains the creation of an entirely new entity, outside an existing commercial organisation. The ultimate driver to found this kind of company is the development of a new leading-edge technology base or a new technology track. Often, the technology development has already been initiated within an existing business unit of the company, but needs further elaboration in a more flexible setting (Parhankangas and Arenius, 2003). Therefore, the basic idea is transferred to a new entity, while the rest of the business unit remains within the parent company. Following this reasoning, technology development spin-offs are created out of strategic reasons perceived by the top management rather than of perceived personal opportunities of a staff member.

At the time of initiation of the project, there were often no markets or competitors for the new technology (Parhankangas and Arenius, 2003). The team is supposed to bring the new technology to maturity (Stankiewicz, 1994) in a more flexible, bureaucracy-independent company and to explore new business areas for the parent company (Parhankangas and Arenius, 2003). Ultimately, the goal of the parent company management is to reintegrate the spin-off in the mother organisation when the project proves to be both successful and strategically interesting.

As the formation of the spin-off is initiated by the parent organisation, the linkages remain strong. Often, the personnel of the spin-off are transferred from the parent company. However, additional externally hired staff is necessary to create a new culture independent from the parental culture. The organisational support for the spin-off is often substantial.

3.3.7. Type VII – Restructuring spin-out

The restructuring spin-out is formed by organisational divisions or strategic business units hived off from an existing company. Mostly, the spinning out occurs for strategic reasons (often during periods of returning to the core business and lowering organisational entropy after periods of diversification) (Besanko et al., 2004; Chemmanur and Yan, 2004). The spin-out is therefore initiated at top-management level and not from a real entrepreneurial reflex.

The technological competences and market approaches have been developed since a long time and are therefore mature (Parhankangas and Arenius, 2003). The former divisions shared technology bases and markets with the entire parent organisation. However, for reasons of renewal of competences, the business unit proved not longer interesting for the (long-term) strategy of the parent organisation. Another possible initiating reason is that the strategic path of the division had become too divergent

Research valorisation through spin-off ventures

(Chemmanur and Yan, 2004). For these reasons, it can be interesting to spin-out the business unit in order not to endanger the (independent) strategies of both entities.

3.3.8. Type VIII – Market differentiation spin-out

The basis for market differentiation spin-outs is the different market to be served by spin-out and parent organisation. This type of spin-out refers to the '*new market group*' of Parhankangas and Arenius (2003). The technology base of the parent firm and the spin-out is basically identical (Parhankangas and Arenius, 2003). However, the goal of the spinning out is to serve a completely different and unrelated customer base. Therefore, both companies are not direct competitors.

In most cases, the spin-out company receives substantial support of the parent organisation. The quality and reputation of the spin-out is guaranteed by the long technological track record gained at the parent firm. The triggering factor for the spinning out is the unwillingness from the management of the parent company to diversify and expand the activities into new markets (Parhankangas and Arenius, 2003). For strategic reasons of both entities, it can therefore be beneficial to spin out the entity to form a new venture, which has the chance to pursue its own strategy.

3.3.9. Type IX – Mixed origin spin-off

Mixed origin spin-offs can be seen as a kind of joint venture between academia and corporation. They offer a mean to grow (Besanko et al., 2004; Daft, 2004) and a way to explore new (technological) horizons for the corporation (Daft, 2004) and a way to valorise research results for the academic organisation. The creation of a mixed origin spin-off requires efforts of both parties, including financial and other resources.

A topic calling for substantial attention in these spin-offs is the governance of Intellectual Property Rights (IPR). As both parties invest substantial amounts of knowledge and expertise, an upfront agreement has to be drawn upon the ownership of the so-called background IPR (Hertzfeld et al., 2006). The knowledge transferred from both parties typically involves both codified (research results, technologies etc.) and intangible (expertise, market knowledge etc.) knowledge.

3.3.10. Type X – Academic spin-out

Sometimes academic organisations spin out an existing entity, often a research laboratory, due to external pressure. In these cases, the activities of the research laboratory are commercial and in competition with those of existing commercial organisations. The reason for the external pressure is that the activities of the laboratory are seen as unfair competition. The knowledge involved is merely tacit knowledge. However, sometimes formal IP can be involved in the transfer to the spin-out.

3.4. Classification scheme and distinguishing characteristics

Table 1 provides an overview of the different types of spin-offs and spin-outs (as discussed in section 3.3), with presentation of their specificities on each of the distinguishing dimensions. This table is a condensed summary of the more elaborated discussions in section 3.2.

Table 1.

Overview of the characteristics of the different spin-off and spin-out types.

	Origin	Founder	Driver	Knowledge	History
Type I Direct research spin-off	Academic organisation	Academic staff member	Institutional policy	Primarily codified	New entity
Type II Tacit knowledge spin-off	Academic organisation	Academic staff member	Institutional policy	Primarily tacit	New entity
Type III Indirect spin-off	Academic organisation	Academic staff member	Personal opportunity	Undefined	New entity
Type IV Student spin-off	Academic organisation	Student	Personal opportunity	Undefined	New entity
Type V Opportunity-driven spin-off	Corporate organisation	Corporate staff or management member	Opportunity	Mixed	New entity
Type VI Technology development spin-off	Corporate organisation	Corporate management	Strategic exploration	Mixed	New entity
Type VII Restructuring spin-out	Corporate organisation	Corporate management	Restructuring	Mixed	Existing entity
Type VIII Market differentiation spin-out	Corporate organisation	Corporate management	Market differentiation	Mixed	Existing entity
Type IX Mixed origin spin-off	Academic & corporate organisation	Staff and/or management member	Undefined	Undefined	New entity
Type X Academic spin-out	Academic organisation	Academic staff member	External pressure	Mixed	Existing entity

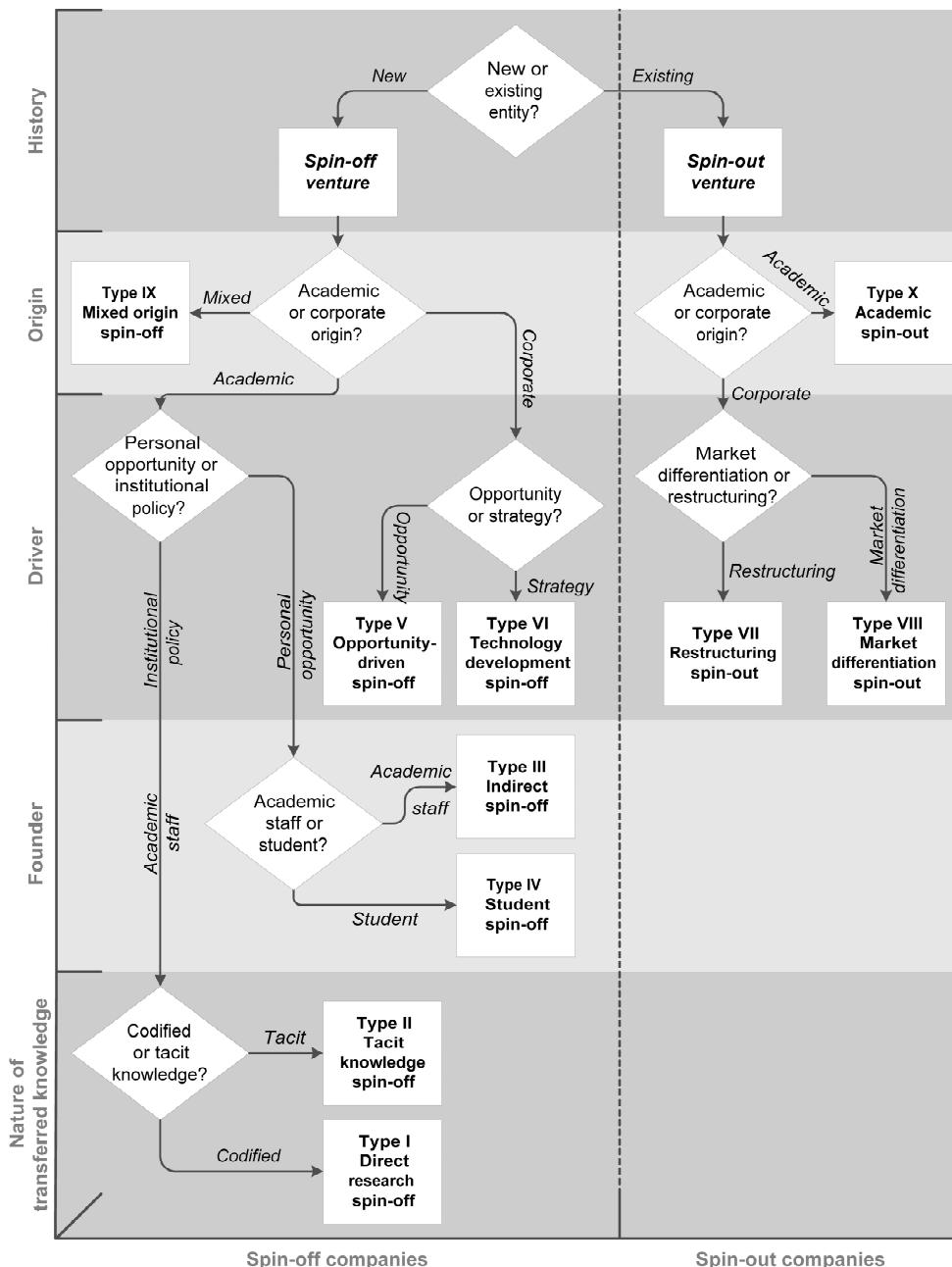
Figure 4 presents a classifications scheme for the different types of spin-offs and spin-outs (as discussed in section 3.3), based on the distinguishing dimensions (as discussed in section 3.2). Using this scheme, practitioners and researchers can

Research valorisation through spin-off ventures

identify univocally the type of venture under consideration, thereby enabling him to take the specific characteristics into account (see Table 1).

An actionable classification scheme as presented in Figure 4 is contrary to what Doty and Glick (1994) posit. However, the authors feel that this scheme, based on differentiation between the spin-off and spin-out types, strongly refers to the theoretical constructs and helps both theoreticians and practitioners to make use of the integrated typology.

Figure 4.
Classification scheme.



4. Advances in theoretical and practical knowledge

After the presentation and discussion of an integrated typology, the question raises to what extent it contributes to advances in both theoretical and practical knowledge. In this section, we will discuss the usefulness of our typology for both theoreticians and practitioners. Additionally, some weaknesses and limitations concerning this study will be discussed.

4.1. Advances in theoretical development

Doty and Glick (1994) suggest that typologies should meet at least three criteria to be theory-building. In the first place, constructs are the building blocks of the theory. These constructs consist of 2 sub-items. Our distinguishing dimensions (section 3.2) refer to the “*unidimensional constructs*” (Doty and Glick, 1994, p.234). Additionally, the constructs contain ideal types of the subject under investigation. In our case, we have identified 10 types of spin-off and spin-out ventures, each with its own specific characteristics and manifestations of the underlying dimensions. Secondly, a theory should contain relationships among the constructs. In section 3.2, we have suggested important relationships between the distinguishing dimensions and the future performance of the new venture. Thirdly, Doty and Glick (1994) suggest that theories should be falsifiable. The authors are convinced that the integrated typology can be tested at 2 levels. The ideal types can be compared to real-life cases, to detect to what extent the ideal types match reality. As the dimensions are rather easily measurable, this aspect can surely be falsified. Additionally, it is possible to determine the influence of the initial resources of a new venture (resulting of the specific interpretation of each dimension in the different types) on its performance. Therefore, the authors suggest that the typology meets the criteria of Doty and Glick to contribute to theory-building in the entrepreneurship literature.

A second important contribution to theory relies in the fact that this integrated view on typologies and taxonomies could lay the foundation of a new wave of studies in the research domain based on this typology, thereby ameliorating the (presently weak) comparability between studies. Too often, the research subjects are not or vaguely defined. In this perspective, the typology could add to future theory building process in the research domain of entrepreneurship and technology transfer.

Finally, the proposed typology can guide the researcher (and the practitioner) to explain observed phenomena. These observations can be related to some of its underlying dimensions, as discussed in this article. For example, the researcher could relate shaky performance of a venture to weak initial resources of the company, resulting of some values of the basic dimensions.

4.2. Advances in managerial and policy making practice

In addition to advances in theoretical developments, the integrated typology offers useful insights for practitioners (especially Technology Transfer Offices of both academia and industry) and decision makers. The typology offers several advances

over existing literature taxonomies. In the first place, the combination of spin-off and spin-out ventures arising from industry *and* academia is rare. Most authors focus on one of both parts of economic reality. Yencken (2002) has made a first attempt to include industry and academic spin-offs and spin-outs in the same taxonomy, without however making any further distinguishing within the corporate venture category. Especially for decision makers, the typology presented in this paper offers insights into the similarities and differences between all the spin-off and spin-out types. Policy makers can benefit in developing measures and policies tailored at the specificities of each type of venture. One could for example think of taxation policies, financial support initiatives or innovation centres offering networking support and business advice.

Secondly, the typology offers advantages for practitioners, in that Technology Transfer Offices (TTOs) of the academic and the corporate world can customise their services offered to the new ventures according to their needs. Both parties will benefit. The efficiency of the TTOs' scarce resources will possibly increase significantly, while the ventures will receive the service and help they really need. In the long term, this amelioration of the service level offered to new ventures could lead to better achievements and more economic value creation, enhancing the economic results and wealth of a region. For example, it can be useful for TTOs to develop a service aiming to help direct research spin-offs to set up an Intellectual Property (IP) management system. This system should guide the spin-off in assessing the need for IP protection, in evaluating disclosure of confidential information to interested parties or in determining the freedom-to-operate of the venture itself.

Thirdly, as discussed in the previous section, the integrated typology can help practitioners to explain different aspects of spin-offs and spin-outs in real-life cases, which relate to some underlying dimensions as discussed in this paper.

4.3. Limitations of the study

No single study or theoretical conceptualisation is free of weaknesses and limitations. Therefore, we will address these issues in this section, in order to draw attention on issues which users of the typology should consider. A first important limitation of the study relies in the fact that it hasn't been falsified yet. This is both a weakness of the present study and a future research opportunity. However, as the conceptualisations in this study have been grounded on practical experience and insights of the authors, we feel confident about the fit between our typology and reality. The integrated typology remains though to be falsified.

Secondly, the authors have suggested relationships between the values of each dimension for the spin-off and spin-out types on the one hand (which influence the starting configuration of the venture) and (future) performance on the other hand. However, the suggested relationships have not further been investigated and are therefore only logic conceptualisations. Again, this limitation can be converted into future research opportunities.

5. Discussion and conclusions

The insights provided by several taxonomies and definitions have proven to be very useful. However, the research domain on entrepreneurial ventures arising both from

Research valorisation through spin-off ventures

academia and industry lacks transparency, comparability and uniformity. As such, this deficiency is typical for rather young research areas, but it harms the process of systematic accumulation of knowledge. Therefore, we have presented an integration of the existing taxonomies, in order to create a clear framework for future research. Our integrated typology is based on the valuable insights provided by other authors. These authors often focus on spin-off companies arising from academia or from industry. The typology presented in this paper adds value by providing an integration of both spin-off origins. Indeed, academic companies and corporate companies share several characteristics. Both the study of the similarities and differences can unveil interesting patterns and lead to valuable insights to boost the creation of the knowledge intensive economy, as defined by the Lisbon goals of the European Union.

The presented typology has been built up around the dual world of spin-off and spin-out ventures. In the first place, research attention goes towards spin-offs originating from the academic world. Four distinguishable types of spin-off ventures are defined in this category. Three of them are founded or initiated by (former) academic researchers, while the fourth spin-off type involves students as founders. This type of spin-off companies has only recently received large media and research attention, since the focus of regional, national and supra-national government programs relies on innovation and valorisation of research results. Additionally, one type of academic spin-out has been identified. The second line of research draws attention to companies being spun out or spun off by existing corporate companies. Most of them are initiated out of strategic reasons (initiated by the management team). However, the opportunity-driven spin-off is characterised by employees seizing opportunities. In this category of corporate companies, the second distinguishing factor is the status of the project before being spun off. Existing entities getting an independent status are called spin-outs, while new entities are called spin-off (this distinction is not necessary for academic companies, as they are all new economic entities). The distinctions drawn by the integrated typology have important consequences for the nomenclature. According to our typology, the concepts of spin-off and spin-out can no longer be used as synonyms. Despite the decreased freedom, these insights should enhance the credibility of the research domain and the reproducibility of studies within this field.

The authors suggest that the integrated typology can form a basis on which future research can rely. This way, the comparability and reproducibility of studies increases, thereby inducing the research field to enhance its process of systematic knowledge accumulation.

Future research opportunities Further research in this domain has several opportunities. Firstly, it should be clear that spin-offs arising from academia face important differences at their origin (resources, culture, support etc.) compared to spin-offs and spin-outs arising from industrial companies. An interesting investigation would be trying to analyse whether these differences erode over time or whether they make a difference in the long run when concerning survival chances for both company categories (academic and corporate companies). Different studies have already tried to unveil founding characteristics that influence the future performance and ability to survive (Aspelund et al., 2005; Bamford et al., 1999; Dahlqvist et al., 2000; Goldenberg et al., 2001; Manigart et al., 2002; Shane and Stuart, 2002). (Aspects of) these studies could be replicated in the light of the insights provided by this article.

Research valorisation through spin-off ventures

Secondly, substantial value and new knowledge would be added to the existing knowledge base through comparison of the different types of spin-off companies in terms of initial resources' influence on performance and survival. This differentiation would prove especially useful for incubators and TTOs, as they would be able to focus on certain aspects that specifically characterise a certain type of spin-off and to provide customised support and advice for each specific spin-off type.

A third important research opportunity lies in the possibility to determine the practical usefulness of the presented typology. It could be interesting to check to which extent the ideal venture types – as discussed in this paper – reflect the reality in the spin-off and spin-out worlds.

6. References

- Aaboen, L., Lindelöf, P., von Koch, C., Löfsten, H., 2006. Corporate governance and performance of small high-tech firms in Sweden. *Technovation* 26 (8), 955-968.
- Agrawal, A., Henderson, R., 2002. Putting patents in context: Exploring knowledge transfer from MIT. *Management Science* 48 (1), 44-60.
- Aguirre, I. d. P., Parellada, F. S., Campos, H. M., 2006. University spin-off programmes : How can they support the NTBF creation? *The International Entrepreneurship and Management Journal* 2 (2), 157-172.
- Aspelund, A., Berg-Utby, T., Skjevdal, R., 2005. Initial resources' influence on new venture survival: a longitudinal study of new technology-based firms. *Technovation* 25, 1337-1347.
- Bamford, C. E., Dean, T. J., McDougall, P. P., 1999. An examination of the impact of initial founding conditions and decisions upon the performance of new bank start-ups. *Journal of Business Venturing* 15, 253-277.
- Bebchuk, L. A., Kraakman, R., Triantis, G., 2000. Stock pyramids, cross-ownership and dual class equity: The mechanisms and agency costs of separating control from cash-flow rights. In: R. K. Morck (Ed.), 2000, *Concentrated Corporate Ownership*, pp.445-460. Chicago (Ill.), University of Chicago Press.
- Bell, C. G., McNamara, J. E., 1991. *High-tech Ventures: the guide for entrepreneurial success*. Addison-Wesley Publishing Company, Massachusetts.
- Bernardt, Y., Kerste, R., Meijaard, J., 2002. Spin-off start-ups in the Netherlands: at first glance. EIM Business & Policy Research, Zoetermeer (the Netherlands).
- Besanko, D., Dranove, D., Shanley, M., Schaefer, S., 2004. *Economics of Strategy* (3rd Ed.). John Wiley & Sons, Hoboken (N.J.).
- Bhidé, A. F., 2000. *The Origin and Evolution of New Businesses*. Oxford University Press, Oxford.
- Bray, M. J., Lee, J. N., 2000. University revenues from technology transfer: Licensing fees vs. equity positions. *Journal of Business Venturing* 15, 385-392.
- Carayannis, E. G., Rogers, E., Kurihara, K., Allbritton, M., 1998. High technology spin-offs from government R&D laboratories and research universities. *Technovation* 18 (1), 1-11.
- Chemmanur, T. J., Yan, A., 2004. A theory of corporate spin-offs. *Journal of Financial Economics* 72, 259-290.
- Chiesa, V., Piccaluga, A., 2000. Exploitation and diffusion of public research: The case of academic spin-off companies in Italy. *R&D Management* 30 (4), 329-339.
- Clarysse, B., Moray, N., 2004. A process study of entrepreneurial team formation: the case study of a research-based spin-off. *Journal of Business Venturing* 19 (1), 55-79.
- Daft, R. L., 2004. *Organization Theory and Design* (8th Ed.). Thomson, Mason (Ohio).

Research valorisation through spin-off ventures

- Dahlqvist, J., Davidsson, P., Wiklund, J., 2000. Initial conditions as predictors of new venture performance: a replication and extension of the Cooper et al. study. *Enterprise & Innovation Management Studies* 1 (1), 1-17.
- Dahlstrand, A. L., 1997. Growth and inventiveness in technology-based spin-off firms. *Research Policy* 26, 331-344.
- Davidsson, P., Klofsten, M., 2003. The Business Platform Model: an Instrument to Gauge and to Assist the Development of Young Firms. *Journal of Small Business Management* 41 (1), 1-26.
- De Coster, R., Butler, C., 2005. Assessment of proposals for new technology ventures in the UK: characteristics of university spin-off companies. *Technovation* 25, 535-543.
- Degroof, J.-J., 2000. High tech entrepreneurship in an emerging entrepreneurial context. Doctoral thesis. MIT Sloan School of Management.
- de Jong, J. P. J., Overweel, M. J., Janszen, F. H. A., 2003. Hightech starters: Waarheden en mythes. EIM Business & Policy Research, Zoetermeer (the Netherlands). (*In Dutch*)
- Di Gregorio, D., Shane, S., 2003. Why do some universities generate more start-ups than others ? *Research Policy* 32, 209-227.
- Doty, D. H., Glick, W. H., 1994. Typologies as a unique form of theory building: Toward improved understanding and modelling. *The Academy of Management Review* 19 (2), 230-251.
- Elfring, T., Foss, N. J., 2000. Competence building: understanding the role of internal venturing and spin-offs. *Advances in Applied Business Strategy*, vol. 6A, 97-119.
- Feldman, J. M., Klofsten, M., 2000. Medium-sized firms and the limits to growth: a case study in the evolution of a spin-off firm. *European Planning Studies* 8 (5), 631-650.
- Garvin, D. A., 1983. Spin-offs and the new firm formation process. *California Management Review* 25 (2), 3-20.
- Goldenberg, J., Lehmann, D. R., Mazursky, D., 2001. The idea itself and the circumstances of its emergence as predictors of new product success. *Management Science* 47 (1), 69-84.
- Goldfarb, B., Henrekson, M., 2003. Bottom-up versus top-down policies towards the commercialization of university intellectual property. *Research Policy* 32 (4), 639-658.
- Grimaldi, R., Grandi, A., 2005. Business incubators and new venture creation: an assessment of incubating models. *Technovation* 25, 111-121.
- Hertzfeld, H. R., Link, A. N., Vonortas, N. S., 2006. Intellectual property protection mechanisms in research partnerships. *Research Policy* 35, 825-838.
- Hindle, K., Yencken, J., 2004. Public research commercialization, entrepreneurship and new technology based firms: an integrated model. *Technovation* 24, 793-803.
- Jagersma, P. K., van Gorp, D. M., 2003. Spin-out management: Theory and practice. *Business Horizons* March-April, 15-24.
- Johannesson, B., Arvidsson, T., Johnsson, T., 1994. Radical venture strategies on industrial markets – extrapreneurship and illegitimate spinoffs. SIRE (Scandinavian Institute for Research in Entrepreneurship), Working Paper 1994:2, 22 p.
- Kakati, M., 2003. Success criteria in high-tech new ventures. *Technovation* 23, 447-457.
- Kazanjian, R. K., 1988. Relation of dominant problems to stages of growth in technology-based new ventures. *Academy of Management Journal* 31 (2), 257-279.
- Klofsten, M., Jones-Evans, D., 2000. Comparing academic entrepreneurship in Europe – the case of Sweden and Ireland. *Small Business Economics* 14 (4), 299-309.
- Leitch, C. M., Harrison, R. T., 2005. Maximising the potential of university spin-outs: the development of second-order commercialisation activities. *R&D Management* 35 (3), 257-272.
- Lockett, A., Siegel, D., Wright, M., Ensley, M. D., 2005. The creation of spin-off firms at public research institutions: Managerial and policy implications. *Research Policy* 34, 981-993.
- Manigart, S., Baeyens, K., Van Hyfte, W., 2002. The survival of venture capital backed companies. *Venture Capital* 4 (2), 103-124.

Research valorisation through spin-off ventures

- Markman, G. D., Phan, P. H., Balkin, D. B., Gianiodis, P. T., 2005. Entrepreneurship and university-based technology transfer. *Journal of Business Venturing* 20, 241-263.
- McQueen, D. H., Wallmark, J. T., 1982. Spin-off companies from Chalmers University of Technology. *Technovation* 1 (5), 305-315.
- Meyer, M., 2003. Academic entrepreneurs or entrepreneurial academics? Research-based ventures and public support mechanisms. *R&D Management* 33 (2), 107-115.
- Mustar, P., 2000. Le bilan de la création d'entreprise par les chercheurs en France. Presentation made at a symposium on the theme 'New business venturing by researchers', Bordeaux, 9-10 March 2000.
- Mustar, P., Renault, M., Colombo, M. G., Piva, E., Fontes, M., Lockett, A., Wright, M., Clarysse, B., Moray, N., 2006. Conceptualising the heterogeneity of research-based spin-offs: A multidimensional taxonomy. *Research Policy* 35 (2), 289-308.
- Ndonzuau, F. N., Pirnay, F., Surlemont, B., 2002. A stage model of academic spin-off creation. *Technovation* 22, 281-289.
- O'Shea, G., Allen, T. J., O'Gorman, C., Roche, F., 2004. Universities and Technology Transfer: a review of academic entrepreneurship literature. *The Irish Journal of Management* 25 (2), 11-29.
- Parhankangas, A., Arenius, P., 2003. From a corporate venture to an independent company: a base for taxonomy for corporate spin-off firms. *Research Policy* 32, 463-481.
- Pirnay, F., 2001. La valorisation économique des résultats de recherche universitaire par création d'activités nouvelles (spin-off universitaires): Proposition d'un cadre procédural d'essaimage. Doctoral thesis. Université du Droit et de la Santé Lille 2, France.
- Pirnay, F., Surlemont, B., Nlemvo, F., 2003. Toward a typology of university spin-offs. *Small Business Economics* 21, 355-369.
- Rogers, E. M., Steffensen, M., 1998. Spin-offs. In: Dorf, R. (Ed.). *Handbook of technology management* (pp.45-49). CRC Press, Boca Raton (FL).
- Shane, S., Stuart, T., 2002. Organizational Endowments and the Performance of University Start-Ups. *Management Science* 48 (1), 154-170.
- Smilor, R. W., Gibson, D. V., Dietrich, G. B., 1990. Spin-out companies: technology start-ups from UT-Austin. *Journal of Business Venturing* 5 (1), 63-76.
- Stankiewicz, R., 1994. University firms: spin-off companies from universities. *Science and Public Policy* 24, 37-43.
- Steffensen, M., Rogers, E. M., Speakman, K., 1999. Spin-off firms from research centers at a research university. *Journal of Business Venturing* 15, 93-111.
- Thornburn, L., 1997. Technology Transfer Through Spin-off Companies: CSIRO – 1985 to 1995. CSIRO, Canberra.
- Trott, P., 1998. *Innovation Management & New Product Development*. Harlow, Prentice Hall.
- Upstill, G., Symington, D., 1999. Generating new companies from CSIRO Technology. CSIRO, Canberra.
- Vohora, A., Wright, M., Lockett, A., 2004. Critical junctures in the development of university high-tech spinout companies. *Research Policy* 33, 147-175.
- Wallmark, J. T., 1997. Inventions and patents at universities: The case of Chalmers University of Technology. *Technovation* 17 (3), 127-139.
- Yencken, J., 2002. Commercialising research through spin-off companies. Invited lead paper at IIR Conference on Spin-off Start-up Companies, Sydney, 27-29 May 2002.
- Yencken, J., Cole, T., Gillin, M., 2002. Spin-off companies from universities and other public research agencies in Australia: findings from early stage case studies. Paper on the Twente University High-Tech Small Companies Conference, Enschede (The Netherlands), 11-12 June 2002.

7. Appendix 1 – Overview of spin-off and spin-out definitions

Table 2.

Overview of spin-off and spin-out definitions

Author(s)	Year	Definition
McQueen, 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)
Garvin	1983	“New firms created by individuals breaking off from existing ones to create competing companies of their own.” (p.3)
Smilor, Gibson, Dietrich	1990	“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” (p.63)
Johannesson, Arvidsson, Johnsson	1994	“... spin-off venturing is associated with new business based on unique internal company resources which are commercialized when an employee gives notice in order to start a career as an independent businessperson.” (p.2)
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, Rogers, Kurihara, Allbritton	1998	“A spin-off is a new company that is formed (1) by individuals who were former employees of a parent organisation, and (2) around a core technology that originated at a parent organization and that was then transferred to the new company” (p.1)
Rogers, Steffensen	1998	“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.”
Steffensen, Rogers, Speakman	1999	“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)
Klofsten, Jones-Evans	2000	“... formation of new firm or organisation to exploit the results of the university research” (p.300)

Research valorisation through spin-off ventures

Table 2 (continued).

Overview of spin-off and spin-out definitions

Author(s)	Year	Definition
Pirnay	2001	“University spin-offs are enterprises created by universities or public research organizations to exploit commercially promising perspectives of certain knowledge or research results.” (p.1)
Clarysse, 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 organization.” (p.59)
Hindle, 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)
De Coster, 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, 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)