Spin-outs

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1 Introduction

1.1 Summary

The subject of this report is spin-outs in the Netherlands compared to those in the Cambridge area. The differences between the two areas have been found to be fewer than expected. The same type of initiatives are to be found in both areas, and the same type of problems are also encountered in both areas In general it seems that it would be advisable for universities to have spin-out stimulation added to the performance criteria to help the better facilitation of spin-outs.

1.2 Outline of the research

1.2.1 Motive for research

The general idea is that the Netherlands are not among the frontrunners in terms of university spin-outs - a reason to launch this pilot study to find the possible causes of this perceived disadvantage. At the outset of this study four potential categories of causes were identified:

- Cultural factors
- Institutional factors
- IPR Policy
- Resources

1.2.2 Outline of the report

This report first presents a brief outline of the method used. Some theoretical background is discussed in the following chapters. The situations in the Cambridge area and in the Netherlands are described under the four headings mentioned previously. Subsequently, a brief comparison of the two areas is given and the limitations of this research indicated. The study concludes with some recommendations.

1.3 Method

1.3.1 Categorisation

In order to reduce sample bias to a certain extent, categorisation was proposed at the start of this research with the intention to identify the scope of the playing field of people involved in activities related to university valorisation. This categorisation is as follows:

Position / Stage	Rent Seeker (stay in ac.)	Spin Out (leave ac.)	Combine (ac. & buss.)
Pre-Start			
Pre-Earnings			
Earnings			

Respondents outside of these categories, but of interest for this study, are people in the ecosystem (incubators, investors) and people with expertise in the subject (academics, advisors).

1.3.2 Different fields of expertise

People involved in these various positions and stages were contacted as were a number of key people in the ecosystem and people specialised in this field both in the Cambridge area, in the South Holland area in the Netherlands, with the universities of Leiden and Rotterdam, and the technical university of Delft. These universities cooperate in various fields. The number of participants in this pilot study was 16 in the Cambridge Area and 8 in the Netherlands, covering the range of the categorisation proposed. Although the various categories are covered by the range of participants involved in this study, it is impossible to assign them to one of the boxes: many of them have multiple roles and in particular persons involved in valorisation may simultaneously be involved in other ventures in different stages. Furthermore, the recurrent perception presented above could be due to a sample bias, even though great care was taken to ensure the inclusion of a range of people engaged in valorisation and related activities. Given that this pilot study is not meant for conceptual or statistical validity but for scoping purposes, this is not an issue.

1.3.3 Interviews

The method of data collection used was that of semi-structured interviews, using a list of topics to be covered. The interviewer ensured that the relevant issues, were dealt with so that a rich set of data could be collected. The interviews conducted for this pilot study were confidential, in an attempt to obtain non-official insights that could potentially indicate friction and provide learning items and insights relevant for fine-tuning policy. After the data had been collected it was analysed and categorised. The categories and the interpretation of the data are presented in the following chapters.

2 Theoretical background

2.1 Research

Basic and applied research are major sources of invention, which in turn lead to innovation and finally commercialisation and diffusion. There are only a few industries that have strong direct links with basic research. Other industries usually benefit from basic research in more indirect ways such as innovations applied in machinery and their employees. The execution of basic research mainly lies within the public domain while the rest of the innovation process is generally performed by market driven firms[1]. They conclude that as a result basic knowledge created within the public sector first has to be transferred to the private sector if it is to be used in the innovation process of the firm. It is not always a simple task to transfer knowledge. Barriers in public-private knowledge transfer often arise out of large distances between research institutions and industry and a lack of commercial orientation on the part of public institutions.[2]

2.2 Definition

It is important to decide how spin-outs are defined for this report. Frerichs and Wiersma (2004, p.38) refer to a definition of a spin-out as: 'an individual or group of individuals leaving a parent firm to start up a new, independent business on the basis of specific knowledge and competences built op within the parent firm'. The parent organisation supports the spin-out by allowing the transfer of knowledge, competences, and/or direct means to the new firm. Wright, Clarysse, Mustar and Lockett (2007, p.4) define university spin-outs as: 'new ventures that are dependent upon licensing or assignment of an institution's intellectual property for initiation'[3]. Wright et al. (2007, p.16) argue that the ownership of intellectual property has important implications in terms of the creation of incentives for academics, and other related parties, to commercialize technology. Where property rights are weak and knowledge is tacit, the transfer of technology can be highly problematic due to problems of hold up. Wright et al. (2007, p.17) remark that in such cases licensing may be problematical so it may be preferable to create a spin-out company and provide an equity-stake as an incentive to the academic. University spin-outs can be distinguished into direct spin-outs and indirect spin-outs. Direct spin-outs are companies that are created in order to commercialize a university's intellectual property. It usually involves licensing and a staff transfer to the young start-up. Indirect spin-outs are companies set up by university staff and/or former students drawing on their experience acquired during their time at the university, but have no formal intellectual prop-

[1] Frerichs F.J. and H.J. Wiersma, 2004, *Academic entrepreneurship: a source of competitive advantage*, Rotterdam, Le Manageur, p. 25-26.

[2] Frerichs F.J. and H.J. Wiersma, 2004, *Academic entrepreneurship: a source of competitive advantage*, Rotterdam, Le Manageur, p. 38.

[3] Wright, M., B. Clarysse, P. Mustar and A. Lockett, 2007, *Academic entrepreneurship in Europe*, Northampton, Edward Elgar Publishing, Inc.

erty licensing or similar relationships.[1] In this report we focus on direct spin-outs.

2.3 Participating in spin-outs

2.3.1 Spin-out development

According to Wright et al. the main focus for all academic entrepreneurs, before recognizing the commercial opportunity, is perfecting the academic research and having their work published for a particular scientific community. Within that research phase valuable intellectual property is created, which then generates the potential opportunity for commercialization. Spin-out development has different phases, the phases they identify are: the research phase, the opportunity-framing phase, pre-organization phase, reorientation phase and finally the sustainable returns phase[2]. They argue that each phase is intended to characterize a specific group of activities as well as strategic focus that the firm must accomplish before it can move to the next phase of development.

2.3.2 Critical Junctures

Critical junctures occur because of the conflict between a spin-outs existing level and type of resources, capabilities and social capital, and those required to perform in the subsequent phase of development. Wright et al. describe several critical junctures in making the transition between the different development phases. Unless each critical juncture is overcome, the venture cannot move to the next phase of development and hence will stagnate[3]. The critical junctures they mention are: opportunity recognition, entrepreneurial commitment, venture credibility and venture sustainability.

2.3.3 Spin-out entrepreneurs

A report from the Ministry of Economic Affairs (2003, p.8) concludes that the average spin-out entrepreneur is a researcher, who is employed at a knowledge facility and wants to become self-employed. They prefer the challenge of commercializing their own technological finding. On average they do not have much entrepreneurial experience and they will most likely make use of the support of the knowledge facility, through housing and the use of technical facilities. They usually make use of managerial advice and advice about marketing and financing. The most important form of support according to spin-out entrepreneurs is the usage of research facilities of the knowledge institution and the technical and managerial advice they receive[4].

[1] Frerichs F.J. and H.J. Wiersma, 2004, *Academic entrepreneurship: a source of competitive advantage*, Rotterdam, Le Manageur, p. 41.

[2] Wright et al., 2007, 115.

[3] Wright et al., 2007, 119-124.

[4] Kreijen, M. en J.J. van Tilburg, 2003, *Researchers op ondernemerspad: Internationale benchmarkstudie naar spin-offs uit kennisinstellingen*, Den Haag, Ministerie van Economische Zaken, p. 8.

3 Cambridge

3.1 Institutional Factors

The above categorisation of people allows a number of institutional aspects specific for the Cambridge situation to be discussed more easily.

3.1.1 Staff positions

At the University of Cambridge, vacancies seem to be mostly full-time and part-time positions for academic staff are rare. Offering more part-time positions could attract entrepreneurs and others already operating at the crossroads between these two worlds to formalise their engagements. Furthermore they could allow academics to be involved in more substantial valorisation activities, and secure an income while undertaking a high risk activity such as a business start up. Another suggestion is to guarantee academics a position after a certain period of time as a safety provision in case the start up is not successful. This may increase academics' propensity to involve in valorisation activities.

3.1.2 Vacancies

Next, applicants are generally obliged to live in or close to Cambridge, so a position is likely to involve moving, alone or with a family. This may impede people applying for positions, especially when entire families are involved. For the present academic staff both barriers mentioned so far do not seem to be a problems as, especially in the (applied) sciences, most academics seems to have obtained their degrees at universities other than Cambridge. However, it is likely that other qualified academics or people from industry interested in part-time positions, made the choice not to move their families or give up their full-time job, hence shaping the academic population at Cambridge.

3.1.3 Students

Students are officially allowed 8 hours of paid work per week, for "education related activities". In practice however, students are involved in (near) Olympic levels of sports, in paid jobs, business plan competitions and even running small to medium sized firms. This practice and unofficial allowances depend largely on the supervisor and department in charge of the student. At one end of the spectrum, students are occasionally reprimanded for working if it is found that their work is slowing down their PhD progress (a rather subjective criterion), at the other end of the spectrum students are encouraged to be involved in innovation, work with companies, network and actively participate in valorisation activities. The engineering department, in particular, seems to have an active entrepreneurial population among its students.

3.1.4 Motivation

The motivation to go into a Higher Education Institution (HEI) differs for students and staff. Students want to earn a degree and the majority strive to go into the professions whereas staff, especially as tenure, enter academia to remain there for a while. Not only do the objectives of these two groups differ, but so do their incentives. Whereas for the tenure academics some valorisation may be a nice additional source of income on the side, students need to secure future income. Such future income may be dependent on obtaining a degree from a

good university to acquire a corporate job, but may be valorisation or other entrepreneurial activities as well to create a job for themselves.

3.1.5 Incentive

A final aspect is that being involved in valorisation activities may provide academics with an income additional to their university salary. Participants in this research describe this salary as less than excellent, especially in the (applied) sciences. Nevertheless, tenure positions in particular are considered to be stable and safe in terms of job security: an "opportunity cost", such as giving up this security for an insecure project like starting up a business is definitely a *disincentive*. This is different again for academics under contract, as they are usually guaranteed a job for only 1-3 years Such contracts seem to be more prevalent in Cambridge than in other universities, and even apply to the majority of academic staff.

3.2 Cultural Factors

Apart from making a distinction between staff and students, it is also useful to make a distinction between arts and sciences. Although this research largely involves staff and students from the (applied) sciences, a few items may be worth elaboration.

In the arts the general idea seems to be to educate an individual person but and in the sciences to apply scientific insight. Aside from the different objectives of these two types of academic inquiry, work stemming from these types has a different valorisation potential and is practised by people with different interests and profiles.

3.2.1 Salary/income

Where professors in the arts are paid more, also because of their number of publications, professors in the applied sciences are more likely to be found among the ranks of people involved in valorisation. When considering this valorisation activity on a department level, the engineering department ranks highest, followed by biotech, advanced materials, chemical engineering, chemistry, physics and medical science.

3.2.2 Applied sciences

One reason given for the lead position of the engineering department in terms of valorisation activities is that people in engineering are very application oriented in nature, and work at the crossroads of technology and the world of business. Further this crossroads position allows for valorisation activities as industry funding can be attracted, versus research council funding only, and joint initiatives between the university, research funding bodies and companies. Taking this into account, one suggestion is to attract more industrial people/entrepreneurs to work with and in academia. Having these people, who would not normally be at a university, with their drive, interests and experience may add to the valorisation mix and compensate for those academics solely interested in one particular field.

3.2.3 Differences

Summarising the above, based on the proposed categorisation, people are affected in various ways and differ from others. The incentives for students and contract academic staff are stronger in terms of securing their financial future, whereas for tenure academics leaving a secure job at a prestigious institute

seems to discourage earning an income additional to their university pay. The highest number of valorisation activities involves the (applied) sciences and, in particular, engineering.

3.3 Resources

3.3.1 Valorisation versus research

Although the Cambridge area seems to be replete with resources for people interesting in valorisation e.g. training, business plan competitions, guides and networking events, the various objectives and incentives identified for students and staff above, point to a gap between resources and results. Although both students and staff may be provided with the same resources, the outcome in terms of valorisation activities may be rather different. Supplying a student with the knowledge and skills necessary for successful venturing may mean this student can create a viable commercial entity, and in search for future income may do so. Providing a particular academic with similar knowledge and skills may be fruitless should the academic have an interest in valorisation only as additional income and as such as an activity on the side, and is busy meeting Research Assessment Exercise criteria (RAE) such as research (publications) and education (numbers) in order to gain promotion.

3.3.2 Motivation

In the case of such an academic the motivation to go enter a HEI may also have been different. Whereas a student may have had financial gain as a primary driver, the academic may have had an interest driven research at a prestigious institute which may or may not involve any short term benefit, valorisation and financial gain potential. For this group of academics promoting valorisation may be considered evangelising and a distraction from their core duties of publishing and lecturing. If indeed no value is attributed to valorisation activities in the RAE, promotion or obtaining a tenure position in the first place, interest driven academics may not further their objectives by being involved in these. However, academic recognition by being eligible to join one of the prestigious Royal Societies, does feature an assessment of valorisation merits. With such valorisation assessment, valorisation has become a worthwhile objective for senior academics.

3.4 Intellectual property rights & benefits

3.4.1 Policy

The current intellectual property right policy has been in force for about half a decade. Prior to 1983 all the intellectual property rights from HEIs in the UK were owned by the British Technology Group, HEIs were not interested in intellectual property. Oxford University, for example, was offered intellectual property by a now major enterprise, but declined it. But Cambridge applied a hands off policy. This policy meant that academics would own their own intellectual property, could negotiate and collaborate with third parties on their own, and the university and Cambridge area benefited from the build up of corporate research labs close to university labs and cross-fertilisation of ideas and research by professors and students alike.

The current intellectual property right policy is summarised in the table below, in terms of intellectual property ownership in the case of licensing, equity ownership in the case of spin outs supported by university funding and benefits resulting from these two activities and from consulting.

Beneficiary / Valorisation	Academic (Staff & certain Students)	Department/Lab	University (Uni & Tech Transfer)
Consulting	85%		15%
Licensing			
- uni claimed	33%	33%	33%
- opt out	85%		15%
- IP waiver	100%		
Spin Out			
- university funds	valuation based (>50%)		valuation based (<50%)

Note: the focus in this categorisation is on the (applied) sciences and valorisation activities and as such does not feature a section on royalties for books and the lecture scene which are additional sources of income open to academics, but may be more relevant to the arts.

3.4.2 Consulting

Of the above types of activities a substantial share of academics in the (applied) sciences are involved in consulting, to the extent that not being involved in some labs would be considered odd. For the academics involved this is a rather easy setup, where in return for a 15% stake the university provides relevant insurances for consulting activities, and hardly any rules seem to exist as to how much and when academics can do this. This is a rather easy source of income as well for the university, although it is less labour intensive on the part of the university staff, consulting activities provide £2.93 million in income which is only slightly less than licensing activities that provide £3.33 million[1].

3.4.3 Incubators

In terms of valorisation activities involving intellectual property, the easier, faster and cheaper route for the university, through its technology transfer office Cambridge Enterprise, is licensing (as opposed to start ups). This is because firms potentially having a use for a particular license can be identified and targeted rather easily and, once the contracts have been made, licensing requires relatively little effort and may result in immediate income lasting for a number of years. This route is also rather easy for the academic involving only limited effort, yet being a potentially fast and steady flow of additional income. There are only a few university assisted spin-outs a year (four in 2006), and these involve substantial manpower, time and capital being invested. In addition, their rate of success is rather low, potential profits are to be expected in the long run only, and it is difficult to actually make an overall profit on these activities and maintain an evergreen capital fund for this. Since its inception, roughly 7 years ago, this technology transfer office has been involved in approximately 50 spin-outs.

[1] Source: *Cambridge Enterprise*, fiscal year ending July 2006.

3.4.4 Valorisation activity

University related but distinctly separate in terms of entity, various associations are engaged in valorisation activities in the Cambridge area. One example is an informal stand-alone organisation, involving university staff, students, entrepreneurs, business angels and VCs. This association has assisted in the spinning out of an exceptionally high number of 150 (university) start-ups since its inception, which preceded the official university transfer office by a considerable period of time. Even so, the substantially lower amount of manpower and costs involved in running the informal association versus the official technology transfer office are remarkable.

3.4.5 Opinion of the current situation?

The way in which the official technology transfer office is perceived by participants in this pilot study, ranging from students and staff to entrepreneurs, investors and advisors, seems to be that the university claims a rather high intellectual property stake, makes the process bureaucratic and slows it down, and as such lowers the incentives for and willingness of staff and students to be involved in valorisation activities. At the far end of the spectrum, some even argue that not having this office would increase the university's endowment by freeing up funds and that the argument that this office actually makes money for the university is questionable. Similarly it is argued that commercial parties are better suited to and have more experience in successfully spinning out and setting up start-ups, and there are examples of cases in which the universities interference was detrimental to success. The suggestion to go back to the previous intellectual property policy or at least adopt a more liberal approach than the current one, with higher incentives and potentially more people involved in valorisation were mentioned a few times. It was argued that policy at university and national level might discourage people from being involved in valorisation and fewer rules might allow those persons interested to go ahead.. In line with this it was suggested that local heroes may have a positive effect on this, with people from the same ranks involved in or having made it through valorisation type activities.

3.5 Generalisations based on Cambridge

3.5.1 Spin-out activity

It is fair to state that the University of Cambridge and the Cambridge area are among a few outliers in a rather substantial population of universities and business centres in the world. On a world scale, several different rankings place Cambridge among the top universities in the world and, although small for US standards, the Cambridge area features one of the largest amounts of start-ups and technology based firms in the past 2-3 decades in Europe. In the Cambridge ecosystem with around 1.500 firms, estimates on start up activity vary from 50-150 per year, be it with a mere three estimated pure university spin outs. Here it should be taken into account that of all these firms, only a handful have been able to compete on a global level, which amounts to a rough ratio of 1:300 of the successful firm population. In addition to this ratio, the total number of firms started, many of which did not succeed, should be taken into account, further lowering this ratio. The cost of setting up a firm, applying for patents etc. may initially be the same for firms that fail, succeed to some extent or are very suc-

cessful. This means that every invention and/or start up that does not succeed involves costs (of at least £10,000) for a university and other investors.

3.5.2 Ecosystem

In terms of ecosystem, the companies in the Cambridge area, generally belong to industries and market segments that are going through their R&D phase at this time. This is a rather unusual situation, as many other commercial centres feature a more diversified population of firms, that may include a majority of mature industries. Mature industries, or companies relying less on technology and R&D, shape a different ecosystem. Such an ecosystem may still interact and benefit the HEIs close to these commercial centres but in a somewhat different way. Although these HEIs are also a source of knowledge, the type and amount of innovation and valorisation may differ greatly and therefore effective policy measures should differ as well.

3.5.3 Global competition

In line with these differences between the ecosystems and the HEIs, it is interesting to note that people have become more mobile and competition more global than in previous decades when most people would go to or work for or with the university that was closest. Competing for students, staff, funding and corporate spending on such a level is simply not possible for any university, certainly not in the short run. What might be possible however, is the creation of knowledge centres, to the extent that companies cannot afford not to have a presence in the place where it is happening, where professors can be contracted for advice or researchers and students can be recruited.

3.5.4 New HEI core activity?

Setting up such knowledge centres or centres of excellence could thus be considered a third pillar for HEIs to actively work on, in addition to education and research. Together these pillars could result in a good reputation and attract people and companies at an (inter) national or even global scale. An example of this is highly intelligent people coming to Cambridge particularly for the Silicon Fen (a nickname for the Cambridge start up phenomenon related to computer science and biotech) experience and/or with the intent of starting a company here. Such start ups could work with existing and new firms, the university, its people and if successful contribute in many different ways to the area, the university and the people living there. As such, having a business ecosystem around an HEI could retain these talented people, furthering a virtuous cycle of interactions and valorisation, rather than having these go back to their countries of origin. However, even when people went back to their country of origin, this need not be a bad thing for the country that (co-) invested in the education or the country that had to do without missed this person for a substantial amount of time. Both stand to gain in the long term through potential collaboration, innovation and valorisation activities, so a longer term, more balanced perspective may be taken. Such longer term view should ideally balance responsiveness to companies, with a longer term view of education and research in existing, new and even not (yet) commercially relevant fields.

3.5.5 Suggestions

Such interactions with start ups and firms, based on the needs of the industries and companies in the surrounding area, may be set up through research collaborations, the possibility of renting highly specialised resources/facilities from uni-

versities, educational projects etc. Different government levels could facilitate interactions such as funding for interdisciplinary labs where start up could work with universities and multinationals for a number of years. Other government programmes, such as SBIR in the US, have an impact on valorisation activities, in advanced materials and nanotechnology, for example.

3.6 Possible Policy Recommendations

This pilot study is based on anecdotal evidence only and cautions against any far reaching commitments based on extrapolations or generalisations made from the above.

3.6.1 Not only university tech centre…

Taking into account that the official university tech transfer route yields 2-5 USOs a year (40-50 since inception) and that this route involves substantial commitments in terms of money (budget ± £6.5 million per annum, venture funding ± £4 million), manpower (± 35 staff) and time-span (± 6-8 years) to set up, it is worth considering the alternatives as well. These are, for instance, informal and private initiatives like a stand alone foundation involving staff, students, investors and alumni that yielded 150 start-ups in the past decades, as well as a student/staff run business plan competition, which has awarded grants 41 funded business ideas since inception, for companies now valued collectively at £42million. Although these routes are not mutually exclusive, cost benefits may be weighed against each other.

3.6.2 Getting involved

Training and socialising people interested in and suited to engaging in valorisation activities and venture into the realms of the ecosystem by 'rubbing shoulders' would be a recommendable thing to do. Doing this would bring these inventors and start-ups into contact with alumni, local heroes, investors and people from potential supplier or client companies as well as potential future team and board members and people from government agencies and funding bodies. In terms of training various methods are available, ranging from subsidised courses to websites (e.g. Venture Navigator in the UK).

3.6.3 Already started

The above two recommendations have already been incorporated to a certain extent in policy e.g. in the UK as part of a recommendation on business university interactions. Further recommendations mentioned by participants in this pilot study, that to a certain extent, have already been implemented or suggested to national governments/universities, are to commission part of the government purchasing to small enterprises (e.g. the SBIR programme in the US), as well as matching start-ups with multinationals and universities in multi year funded collaborative research projects and stimulating and funding the creation of centres of excellence for HEIs to compete on an international level.

3.6.4 Conclusion

Cambridge University's academic culture is rather similar to the Dutch universities'. The focus in both cases is: research and publish. This culture does not provide favourable conditions for academic start-ups in a number of respects. Intellectual property rights policy is an exception: Cambridge's policy on ownership

and transfer of intellectual property rights and compensation for transfer, licenses, etcetera is explicit and well developed.
Therefore, Cambridge University's status as an international benchmark of cooperation and exchange between academia and business can not be attributed to this culture, but rather to other arrangements linking (research-oriented) business to university resources and facilities.

4 The Netherlands

4.1 Institutional factors

4.1.1 Who is involved?

In the Netherlands most spin-out entrepreneurs used to be employed by a knowledge institution. Around 30% of the spin-out starters from universities were employees, around 20% were PhDs and another 20% recently graduated students. The remaining 30% consisted of a few other categories. Commonly mentioned reasons for being involved in a spin-out start up are the opportunity of taking on the challenge, a wish to be self-employed and to be able to do specific work which it would not otherwise be possible to do[1]. Recently graduated students starting spin-outs is in line with the stimulation of awareness amongst students. Around 80% of Dutch universities are trying to make students aware of the possibility to start a spin-out[2].

4.1.2 Entrepreneurship

This is contradictory to a complaint often expressed by the staff of technical universities about the lack of focus on entrepreneurship. Reasons mentioned for not wanting to be involved in spin-out start ups are mainly the (perceived) lack of entrepreneurial skill and being unfamiliar with how to start up a company[3]. Most students never encounter courses about entrepreneurship, mostly because they are not obliged to take such courses. It has been suggested that there should be more interaction between universities and entrepreneurs. One example of such an idea would be to invite entrepreneurs to give lectures at the university to inspire students to at least consider it as a serious option. Part of the student population will obtain positions at the university themselves, if they have encountered entrepreneurship themselves and they feel positive about it, this might facilitate better interaction with business life and universities in the future.

4.1.3 Focus

In line with the alleged lack of introduction to entrepreneurship it also seems that students in the Netherlands are still too focussed on a safe career path in a large company or institution. On the other hand universities do not seem to be keen on promoting entrepreneurship, even in their own ranks. A good example is a faculty member who suggested taking some sort of sabbatical, with the option of returning should the entrepreneurial activity not prove to be successful. The proposal was rejected with the announcement that the proposal was not an option. Research from 2003 shows that only 14% of Dutch universities saw stimulating spin-outs as important then, against 71% of foreign universities.[4] However, since 2003 both national and university policies have changed, and new initiatives introduced aiming at better valorisation of university knowledge and

[1] Kreijen, M. en J.J. van Tilburg, 2003, *Researchers op ondernemerspad: Internationale benchmarkstudie naar spin-offs uit* kennisinstellingen, Den Haag, Ministerie van Economische Zaken, p. 31.

[2] Kreijen en van Tilburg, 2003.

[3] Kreijen en van Tilburg, 2003, p. 32.

[4] Kreijen en van Tilburg, 2003. p. 53.

patents, developing policies with respect to intellectual property rights, setting up business incubators, and so on.

4.2 Cultural factors

4.2.1 Funding

In the Netherlands researchers, and also investors, seem to be rather risk averse. Also, business failure is a stigma: previous bankruptcy makes it considerably harder to raise funds. Due to such scepticism, there is less funding available than in countries such as the United States where failure is considered to be a positive learning experience.

4.2.2 Combining strengths

As mentioned before, it seems that technically oriented institutions lack focus on entrepreneurship. One suggestion is to bring technically capable people together with entrepreneurial people, to form a complementary team with good ideas and a market focus. This is a practice applied in the United States, where scientists are matched with a CEO/entrepreneur with business expertise in the market,in which the scientist wants to launch an idea and can assist the scientist to valorise the scientist's idea.

> **Quote** (incubator manager)
> '…most scientists are not entrepreneurs. Therefore, they will always get teamed up with a business man who understands entrepreneurship…'

4.2.3 Large companies

Some large companies' policies are less favourable to spin-outs, for example, labour contracts stipulating that all R&D-personnel's findings and ideas are company property, and competition clauses against working for (possible) competitors for a certain period of time. Students' preference for a large company can have a negative influence on their attitude towards entrepreneurship. The certainty of a job can slowly but steadily erode the urge to become one's own boss. In addition this urge can meet company barriers as described.

4.2.4 Performance criteria

An important factor assumed to have a negative influence on the number of spin-outs are the criteria to evaluate academic researchers' performance. The traditional focus at universities is on producing publishable knowledge and some critics argue that this focus is even increasing. This diverts the focus from applied research and, as a second order effect, diminishes the potential for spin outs, because applied research generates ideas and products that can be marketed. Therefore, valorisation activities and applied research should be included in the performance evaluation of researchers and universities.

4.2.5 An entrepreneurial mindset

A comment often made about universities is that they are not business minded (enough). An example is a students' course involving an internship at a company to allow them to become acquainted with entrepreneurship, with the teacher setting the minimum company size at 25 employees. Most start ups are smaller and plenty of very "entrepreneurial" companies employ fewer than 25 employees.

Quote (incubator manager)
'…on the one hand there is a special programme to stimulate entrepreneurship, but on the other hand students are discouraged to do an internship in a small company…'

4.3 Resources

4.3.1 Finance

Activities can be financed with grants, loans or by investors. Usually there are no special problems in the first phase: product development. But substantial investments are required to proceed from concept to reality, and these are often hard to get.

Quote (incubator manager)
'…financing up to roughly € 50.000 is no problem: any start-up with a thorough plan can get that through informal sources. Over € 2 million euros isn't a problem either: if he can show the idea's potential there are always investors willing to participate. The main problem is the category in between: there is hardly any funding for them…'

Another remark is that although the financial means are fairly easily obtainable, it is access to the right people that is the biggest problem. A suggestion is to have universities help the spin-outs to make contact with the right people by allowing access to their relational network.

4.3.2 Facilities

When it comes to resources in an early stage, most spin-outs can use at least some facilities at the university. These can be in the range of modest housing up to using campus facilities such as research laboratories. Area010 is the Erasmus University Rotterdam incubator, offering access to all kind of facilities. It also provide start-ups with coaching, advice and access to their relational network. YES!Delft is the Technical University of Delft's incubator. According to a successful spin-out from this incubator, around 70% of the students are familiar with the activities of YES!Delft. It offers special courses aiming to bridge the gap between the original field of work and the all round knowledge required to be capable of running a business. YES!Delft has an arrangement with the Technical University to offer a range of standard agreements to spin-outs. These agreements range from establishing a partnership with the university up to having the university take the initiative to found a company, including investing start-up capital.

4.4 Intellectual property rights and benefits

4.4.1 Policies

Dutch universities have only recently adopted intellectual property rights policies and not all of these policies are clear to potential users. In particular, some of them mention lack of clarity as to who is the owner of intellectual property rights.
Also, it takes time for universities and university departments to lay down rules for intellectual property rights and develop a transparent policy in applying them.

Their learning curve sometimes includes trying to get the maximum they can out of the deal, which can obviously be an obstacle for spin-outs: uncertainty about intellectual property rights makes it harder to attract investors.

On the other hand, lacking a sound policy on patent and other intellectual property rights, universities have made their knowledge available to individuals and firms under unfavourable conditions in the (recent) past. Some of their clients obtained knowledge for bargain prices. Critics point out that universities that value their knowledge correctly is common practice in the United States.

Recently (some) Dutch universities have also adopted new valorisation policies l and even established valorisation offices, making inventories of available knowledge, and with options ranging from (contracts with) spin-outs, through licensing and transfer of property rights to existing companies at market prices, to establishing a university owned company to exploit a finding based on university owned knowledge. Examples are Leiden University (Luris[1]) and Erasmus University Rotterdam (Erasmus MC Holding[2]).

4.4.2 University perspective

From the perspective of universities it seems clear that they themselves feel the need to better manage and valorise their generated knowledge. However it seems that there is a general preference for licensing. One of the main reasons for this is if knowledge is sold or transferred too soon and the spin-out fails the knowledge might be lost. Another scenario is that market parties will be able to obtain the knowledge too easily after a spin-out fails. The opinion is to not sell the intellectual property rights on knowledge until it is certain that the knowledge is so far developed that it can be valorised successfully. Most universities want to (or are already doing so) have better screening of ideas and knowledge that has commercial potential. Patents are applied for only if the idea is seen as truly valuable and those patents will issued for commercial use through a licensing system. If the idea is exceptional the university may decide to start a business to exploit it, and eventually sell the business later when it is successful. Leasing the commercialization of university owned knowledge, or an idea based on knowledge developed at the university to a *spin-out* is an option. But it is only one option in valorizing commercially useful knowledge and not always the best option from a university's (or tax payer's) point of view. Questions to be answered are for example: is the spin-out entrepreneur commercially competent, and does it take a certain firm size or an international distribution network to launch the product (economies of scale)? If the answer to the latter question is positive, the profits of the university owned idea, knowledge or product may, eventually go to any smart (foreign) entrepreneur capturing it when the original spin-out fails, even if the answer to the previous question is positive.

[1] Leiden University Reseach and Innovation Services: http://www.luris.leidenuniv.nl.

[2] http://www.erasmusmc.nl/tto/.

5 In comparison to Cambridge

5.1 Job security

Cambridge university offers hardly any part-time positions. Increasing the number of part-time positions could attract people who operate at the crossroads of science and entrepreneurship. In the Netherlands it has also been said that it would be good to have entrepreneurs involved with universities to stimulate future entrepreneurial activity. Although it has been commented that university pay is less than generous, which could stimulate participating in spin-outs, the jobs at universities usually offer high job security, that can be considered to be a disincentive.

5.2 Policy

Intellectual property right policy is better developed in the United Kingdom than in The Netherlands. The current policy has been in force for about five years, but there was other policy in force before then. There is different policy for different types of knowledge exploitation. Although there is policy, it seems curious that for consulting activities 85% of the benefits goes to the academic while, at the same time there seem to be hardly any rules as to how much and when academics can spend on such activities. Dutch universities are making up arrears, however, with technology transfer initiatives, clearer and more explicit patent and intellectual property rights and valorisation policies, and even valorisation offices (LUMC, EMC).

One of the reasons could be that consulting activities yield a steady flow of income for the university. The easiest route for the university to valorise knowledge is licensing, which is the same as in the Netherlands. At Cambridge university there are only a few spin-outs per year and these involve considerable effort in terms of manpower, time and capital invested. University assisted spin-outs have a bad track record as to success rates and long time earnings. In addition to the university itself assisting spin-outs there are several university related, but independent associations that engage in valorisation. In the Netherlands there are also such initiatives.

5.3 Slow and bureaucratic

As for intellectual property rights the general opinion in the Cambridge area is that the university claims a rather high stake and makes the process bureaucratic and slow. This is perceived as lowering the incentives for and willingness of staff and students to be involved in valorisation activities. It has been suggested that fewer rules might allow interested parties to go ahead with their activities. On the other hand, there are fewer specific rules in the Netherlands but the process is also slow and bureaucratic.

5.4 Conclusion

Academic policies are not conducive to stimulating spin-outs, in The Netherlands nor in the UK. The Cambridge success story can be attributed to other arrange-

ments enabling and stimulating cooperation and exchange of resources and facilities from university to (high tech, research-oriented) businesses and vice versa, and providing "agglomeration advantages" for this mixed community.

6 Limitations and recommendations

6.1 Is it so similar?

The Cambridge area is considered a benchmark for start-ups of technology based firms. A notable similarity between the interviews conducted in the Cambridge area and in the Netherlands is that the same type of problems are mentioned. The same type of initiatives have also been started in the Netherlands, although they have been in place much longer in the Cambridge area. Since the results are based on a small selection of interviews it is hard to draw generalized conclusions. It is likely that the problems encountered in the Cambridge area are of another level of sophistication than in the Netherlands but, even if that is the case, the types of problems are basically the same. As mentioned before, other arrangements between university and (high tech, research-oriented) business have led to the Cambridge success story.

6.2 Additional research

6.2.1 Longitudinal study?

To obtain accurate measurements as to whether current spin-out policy and facilities are sufficient and even successful, a large scale study should be conducted to monitor several universities and their incubator institutions or affiliates over a longer period of time. Only then can the true limitations be identified and the success ratio verified.

6.2.2 What could be better?

At the present time, based on the limited number of interviews held, it is possible to mention some items that could most likely be improved. Improving awareness of self-employment as a job perspective and offering training to would-be entrepreneurs has been mentioned, especially the shortcomings of most university departments, in this repect. This applies both to faculty staff, including the lack of incentive to spin out, and to students who receive little encouragement to consider self-employment or are even made aware of this option and have little or no training in entrepreneurial skills.
A second possible action is to offer access to labs and other research facilities, and reduce barriers to spin-out start-ups. A major barrier is the 'status' at universities of entrepreneurial activities by staff members or students: performance as a scientist (publications) ranks first in job evaluations, entrepreneurial performance does not count at all.
And third, more progress can be made in clearly defining intellectual property rights for all those that might be interested, including conditions for purchasing these rights from the university (/department).

Quote
'awareness of training efforts are necessary entrepreneurship must get more status within universities in addition to doing research and teaching…'

Quote
'…the way teachers and staff have contributed to enabling entrepreneurship should be correctly evaluated als a core component of every job evaluation…'

Quote
'…in the current situation spin-out activities of teachers and staff take place at the cost of other activities such as teaching and research, although they receive credits for the last two. This means that initiative is punished, therefore such efforts must be evaluated in the same way as teaching and research to be able to improve…'

This also includes active focus on the taxation of knowledge, knowing its correct value helps in the debate on dividing intellectual property rights. Of course there will always be room for disagreement about who should get which share of the intellectual property rights, but the discussion should be held in advance and not when the researcher is about to start a spin-out, this would have a demotivating effect. If universities are prepared to valuate knowledge better, they should also be prepared to open up their relational network. This will increase the success-rate of spin-outs, because one of the most commonly heard difficulties is not knowing the right people.

Quote
'…it's not disagreement about who owns the intellectual property rights, or what's the remuneration, but the fact that there hasn't been anything documented at all…'

6.2.3 Recent developments

A positive note here is that in general it appears that during the last few years a number of actions pointing in the right direction have already been taken: better definitions of intellectual property ownership and conditions for purchasing university-owned IP, and establishing business incubators for students and post-docs spinning out. Successful examples are Area010 (Erasmus University, Rotterdam) and YES!Delft (Technical University, Delft). In addition Leiden and Erasmus MC have started valorisation offices both for promoting knowledge transfer and spin-outs, and producing returns to the university from this transfer through licences and royalties.

6.3 Current situation

6.3.1 Spin-out participation

On average half of the knowledge institutions in the Netherlands is participating in spin-outs. Sometimes a separate holding is founded and sometimes private equity is involved. The most commonly used method for financial support is granting a(n) (interest-free) loan, although this is used less in the Netherlands than in other countries[1]. Licensing is a common practice, which is used more by universities than research institutions and even more in other nations. Transfer

[1] Kreijen, M. en J.J. van Tilburg, 2003, *Researchers op ondernemerspad: Internationale benchmarkstudie naar spin-offs uit* kennisinstellingen, Den Haag, Ministerie van Economische Zaken, p. 9.

of patents is done more by universities (70%) and less by research institutions (13%).

6.3.2 Room for (further) progress

The general conclusion of the report is that valorisation policies have improved a great deal, but that there is still room for (further) improvement. According to the 2003 report (Ministry of Economic Affairs, p.40) agreements are made by half of the knowledge institutions about ownership and reimbursement for the use of the knowledge by spin-outs. In about 78% of the cases these are satisfactory for the spin-out entrepreneur. In the United States there is special legislation for spin-out stimulation, while in the Netherlands there is no relevant specific legislation. (Ministry of Economic Affairs, p.50).

6.3.3 Some ideas

The recommendations for knowledge institutions to incorporate spin-out policy in their strategy, organisational structure and culture, and in their arrangements can be further elaborated. Entrepreneurship should be stimulated by knowledge institutions' employees. Spin-out support should become more professional.

Universities in the Netherlands seem to lack commercial orientation. On the other hand it has been stated that most spin-out entrepreneurs are researchers who wish to be self-employed, often with little entrepreneurial experience. In most cases parent organisations seem to support spin-outs, which should match perfectly with the expressed need of spin-out starters to have support from the parent organisation. The most required support is the use of research facilities and technical and managerial advice.

6.3.4 Stimulating awareness

There is an opinion that the lack of entrepreneurship can be adjusted by paying-giving it more attention in college. Promote entrepreneurship so that students do not automatically consider working for a large company as the only possibility for a good career. In addition, there should be a focus on entrepreneurship at universities. This can be done by adding goals for universities to achieve, in the form of the amount of applied research carried out. Applied research has proven to be the best way to bring knowledge to the market. Researchers often lack entrepreneurial skill, it has been suggested that a researcher should be matched with an entrepreneur. In addition to entrepreneurial skills finances are needed to start spin-outs. In most interviews it has been said that obtaining financing is not usually the biggest obstacle, there does seem to be a serious need to know the right people. In line with a more entrepreneurial attitude at universities, the universities could also start opening up their relational network for spin-outs, to help them to contact those people who can help them.

> '…universities should use their network for the benefit of graduates and recently graduated, with a stronger connection amongst alumni, for example. That would highly increase the chance a new initiative will succeed. Access to a social network is at least as important as decent housing…'

6.3.5 Developing a sound IPR policy

One of the most commonly heard complaints when it comes to policy is that although there is no policy when it comes to intellectual property rights, that does not mean that there can not or should not be clear agreements. Intellectual

property rights can be combined with a good taxation of knowledge and divided based on the estimated value. If a university is indeed given a target when it comes to applied research and amount of spin-outs generated, it will most likely increase its focus on the improved taxation of knowledge.

6.4 Conclusion

The subject of this pilot study is that universities in the Netherlands are lagging behind the Cambridge area with respect to the number of spin-outs. This report indicates that circumstances are not perfect but that the Netherlands is certainly heading in the right direction. On the other hand, Cambridge university seems to have to deal with many of the same problems: limitations for university staff, and a lack of resources from the university itself to be fully involved in successfully helping spin-outs. The main difference between the current situation in the Netherlands and the Cambridge area seems to be Cambridge's longer experience with this phenomenon. Research indicates that stand-alone organisations facilitate spin-outs more than the university itself.
Cambridge's success in attracting business is due to other arrangements that enable and stimulate cooperation and the exchange of resources and facilities from university to (high tech, research-oriented) businesses and vice versa, and by providing "agglomeration advantages" for this mixed community.

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