

INNOVATIVE ENTREPRENEURSHIP VIA SPIN-OFFS OF KNOWLEDGE CENTERS

Several think tanks and policy makers uttered their concern about the shrinking number of start-up companies in Flanders. At the same time, however, the number of spin-offs from knowledge centers (universities, colleges, strategic research centers) appears to be rising. Such spin-offs are created mainly in innovative fields such as biotechnology, ICT, energy and environmental technologies, as well as in the services sector.

Clearly, the authorities and the region's existing industrial networks are important catalysts for the development of spin-offs. The Natural Sciences Class and the Technical Sciences Class of the Royal Flemish Academy of Belgium for Science and Arts (KVAB) set up a joint working group co-chaired by prof. dr. ir. Charles Hirsch (VUB/Numeca International) and dr. ir. Erik Tambuyzer (Center for Medical Innovation vzw/ABConsult bvba) with the aim of investigating which initiatives could be recommended for the different stakeholders (authorities, education, knowledge centers) to reinforce the positive trend. Indeed, encouraging innovation is a top priority for a region like Flanders, but its valorization is a top priority too.

Beside the two co-chairpersons, the members of the working group from the Natural Sciences Class were: prof. dr. ir. Roel Baets (department photonics of UGent), prof. dr. Yvan Bruynseraede (department physics and astronomy of KU Leuven) and prof. dr. Jean-Pierre Henriët (department geology and soil science of UGent).

From the Technical Sciences Class the following members participated in the working group: prof. dr. ir. Bart De Moor (department ESAT – electrical engineering - KU Leuven), ir. Dirk Fransaer (VITO) and prof. dr. ir. Willy Verstraete (department microbial ecology of UGent).

Moreover, dr. Johan Cardoen (Flanders Institute for Biotechnology), Jos Peeters (Capricorn Venture Partners), prof. dr. Yves Fassin (Vlerick Business School), Patrick Dhaese and Patrick Vankwielberge (TechTransfer UGent) contributed as external experts to the resulting position paper as well.



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**Charles Hirsch
Erik Tambuyzer**

Met steun van de
Vlaamse overheid



Vlaanderen
In Actie
Pact 2020



Koninklijke Vlaamse Academie van België
voor Wetenschappen en Kunsten, 2015
Standpunten 32

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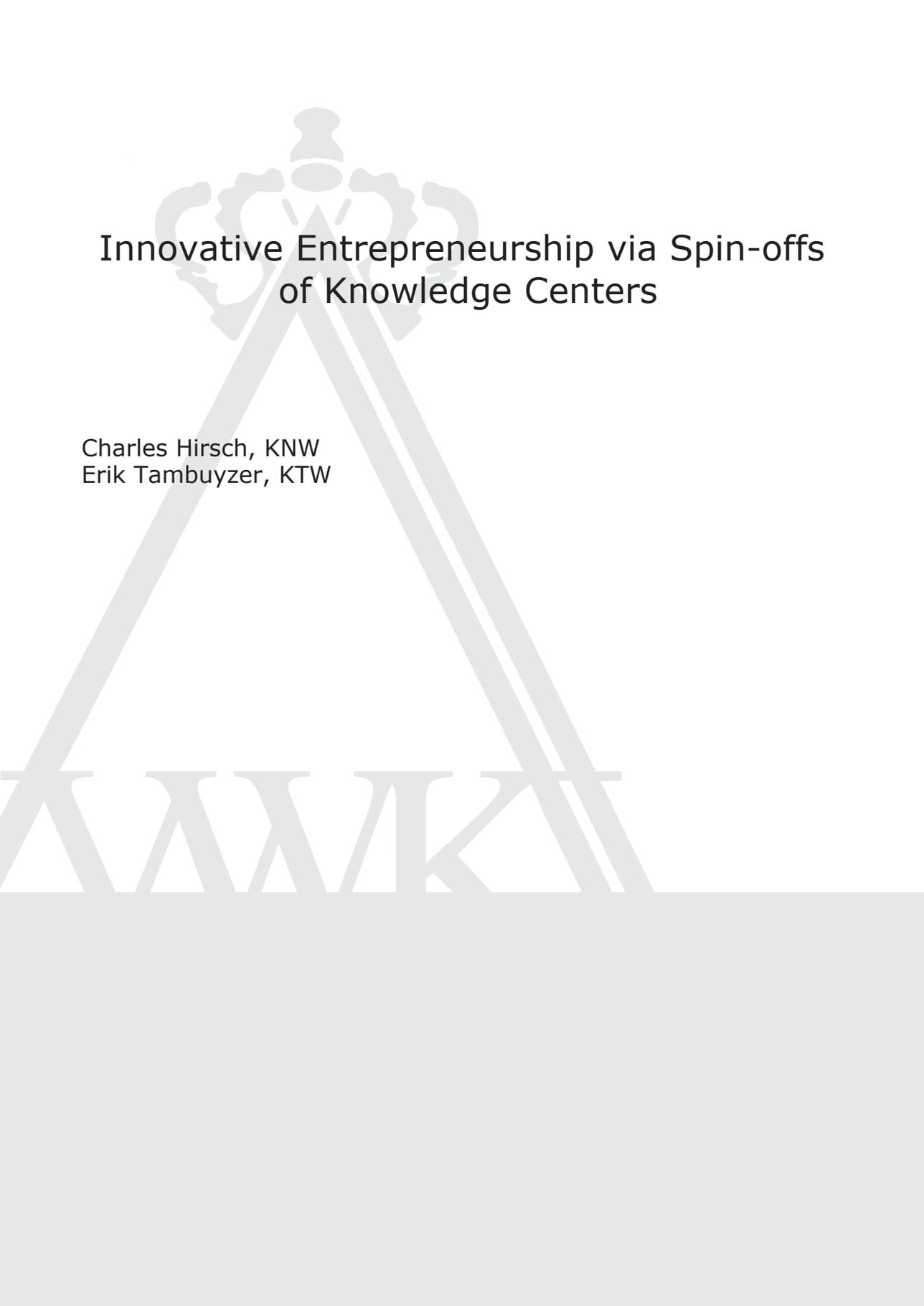
Editions
Of
the Royal
Flemish Academy
of Belgium
for Sciences
and Arts

Position paper nr. 26



KVAB Press

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The publication of this position paper has been approved by the general assemblies of both the Natural Science Class on the 11th June 2014 and the Technical Science Class on the 24th June 2014.

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D/2015/0455/03
ISBN 978 90 6569 147 7

Photo and cover design: Anne-Mie Van Kerckhoven

Position paper – Royal Flemish Academy of Belgium

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Executive Summary

With this position paper, the Technical Sciences Class (KTW) and Natural Sciences Class (KNW) of the Royal Flemish Academy of Belgium for Science and Arts (KVAB) would like to draw the attention of the political world as well as the general public to the finding that the number of start-up enterprises in Flanders has decreased lately, while the number of spin-offs from knowledge centers has increased. There are numerous initiatives in Flanders, Belgium and Europe that seek to promote business start-ups. This position paper is specifically about spin-offs arising from knowledge centers, therefore making an immediate link to innovation. These spin-offs are located mainly in the high-tech world such as biotechnology and ICT as well as in environmental technologies and service sectors.

Different stakeholders play an important role in the creation of spin-offs.

First of all, we have the knowledge centers in Flanders; **mainly the universities, colleges and strategic research centers** (SRCs). Increasingly, these centers train entrepreneur-students or researchers who later valorize their know-how in their own business. These centers can take many supporting initiatives that promote a culture of entrepreneurship, such as paying attention to entrepreneurship in their courses, through interaction with the ‘market’ (such as interaction with companies), providing professional support through their technology-transfer-offices (interfaces) and by setting up seed funds.

Along with greatly increased research funding, a large potential pool of human resources has been created in Flanders that sometimes seems to be caught in a “golden cage”. These knowledge centers should actively scout for entrepreneurship talent, so that, with the right attitude and *coaching*, these individuals can actively engage in a spin-off and learn more about customer focus.

An important role has been assigned to **government**. After all, even in high-tech sectors an excellent social and fiscal environment is of the utmost importance to encourage would-be entrepreneurs to take the risk. Politicians and policy makers should create a climate that better values entrepreneurship, putting it in the spotlight, and promoting it. They should consolidate the existing tools and develop new instruments to allow new talent pools to be led to entrepreneurship and thus to be led to society. The complex and sometimes time-consuming administrative burdens for starting and maintaining businesses, should be addressed more intensively. Above all, continuity in policies concerning entrepreneurs and enterprises is a must, also and especially across different legislatures.

Likewise, there is an important role to play for the **business world** and the **world of education**. A sense of entrepreneurship deserves attention at all levels of education, and should be worked into the curriculum as experience-based as possible. This integration can be done by a stronger and more structured interaction between industry and education right from the beginning at young age. This interaction will be discussed in detail later.

The final success rate of spin-offs depends on many factors. The most important factor is the quality of the starting core team. What approach can be used to prepare researchers who set up a spin-off optimally? Hereby, not only economic aspects are of great importance. Correspondingly, the ethical dimension of entrepreneurship has been growing constantly, such as in corporate sustainability or social responsibility, and entrepreneurship in sectors that are not automatically associated with industrial or commercial activities, e.g. the health care sector.

There are several other factors that play a large role in maximizing the success rate of a spin-off, but one major factor that should still be mentioned is to provide a sufficient incubation period for a new enterprise. For this reason, government and knowledge centers should develop together a policy that allows for a sufficiently long incubation period, such that the social and economic impact of the spin-offs increases.

Recommendations

1. The government must create the preconditions for successful entrepreneurship.

Politicians and other policy makers should create an environment that better values entrepreneurship, brings it positively into the spotlight and promotes it. To this end, new tools should be developed on top of existing tools to allow for successful entrepreneurship to happen in a relatively short period of time. Due to the high quality of our knowledge centers, we have a large potential source of innovative entrepreneurs available.

2. Our knowledge centers (universities, colleges, and strategic research centers) deliver top talent for entrepreneurship.

The instruments for spin-off creation in our knowledge centers have been well developed in the meantime. Within the large potential pool of human resources that resulted from the strong growth in research funding over the last decades, active scouting for talent for entrepreneurship is recommended. Investment in this talent and intensive coaching will ensure that individuals, particularly young people, who possess the appropriate skills to actively participate in a spin-off, actually get a chance.

3. Longer incubation?

Knowledge centers should develop, where appropriate together, a policy that allows for longer incubation periods such that the social and economic impact of the spin-offs substantially increases and the risk of failure is reduced.

4. Financiers provide a diverse range of investment vehicles, but gaps remain.

Gradually, a large range of investment funds exist in Flanders that spinoffs can tap into: government (SOFI, GIMV, PMV, IWT, Agentschap Ondernemen), knowledge centers (seed funding) and 'private' investors. Nonetheless there are gaps in the investment landscape,

namely there is a need for growth funds to, for example, survive '*the valley of death*' or to enter the global world market.

5. Already a part of the education world is spending considerable attention to the societal role of entrepreneurs and business.

A sense of entrepreneurship and taking business risks deserves attention at all levels of education (i.e. primary, secondary and higher education), and should be worked into the curriculum as experience-based as possible.

6. Failure and making mistakes should not be a problem as long as one learns from these.

Innovation and starting a business implies that risks must be taken. Consequently, making mistakes is an essential part of doing business, and that should be more and better recognized.

7. Ethical and deontological dimensions are increasingly important in the entrepreneurial context.

In education, the explicit and implicit aspects of doing business must be addressed, particularly with respect to corporate sustainability or social responsibility and the role of entrepreneurship herein. From an ethical perspective, it is particularly important that every knowledge center develops a generic deontological code of ethics that explains, in a transparent way, what attitude or position all parties in the course of the establishment of the spin-off should adopt.

1. Introduction

After the successful symposium “The Role of Spin-Offs in an Innovation Strategy” of September 26, 2013 (1), it was decided to formulate on behalf of the KVAB a “Position Paper” with recommendations about this topic. The Technical Science Class (KTW) and Natural Science Class (KNW) of the Royal Flemish Academy of Belgium for Science and Arts (KVAB) would like to draw the attention of both the political world as well as the general public to the finding that the number of spin-offs from knowledge centers has increased, while the number of start-up enterprises in Flanders has decreased. Flemish knowledge centers are becoming more active in promoting entrepreneurship (2). Although the spin-offs launched are usually active in the ‘high-tech’ sector, e.g. ICT and biotechnology, the share of ‘high-tech’ innovation is increasing in the ‘traditional’ sectors as well. Moreover, it is known that employment strongly increases and is more sustainable in high-tech related companies than in traditional sector companies, mainly due to recurring and continuous innovation.

This fact is relevant in Flanders, where economic activity is essentially based on small and medium-sized enterprises. According to the Unizo Starters Atlas (3), the total number of starting businesses has fallen sharply in the last two years.

Moreover, in Section 4.1.1 of the first report of the *International Advisory Board* of the VRWI (Flemish Council for Science and Innovation) dated June 2014 (4) the following can be found:

“People in Belgium see more opportunities in becoming an entrepreneur compared to the EU average (31.5% versus 28.7%). However, this is not translated into entrepreneurial intentions, which (at 7.8%) are well below the EU average (13.5%). There is a clear link to the mindset: people in Belgium display higher fear of failure (46.6% vs 39.8%) and have less belief in their capabilities of becoming an entrepreneur (33.8 vs 42.3%). Also, people in Belgium are not positively disposed towards successful entrepreneurs: Belgium scores below the EU average when it comes to media attention or high status of successful entrepreneurs.”

Recently, a few Flemish spin-offs have been discussed in the press but only because they were sold to foreign entities or had gained international success. As such, the debate about ‘anchoring’ companies in Flanders invariably continues to blaze. This is a debate about physical and geographical embedding in a particular region, which seems outdated in our increasingly globalized world economy. Therefore it is particularly important for Flanders to anchor knowledge, and this is just what the development of knowledge through Flemish spin-offs is about. This knowledge anchoring also indicates the growing importance of both education and research in our knowledge centers that internationally, due to our high quality expertise, are highly regarded.

This position paper is organized as follows:

- In Chapter 2, we define the subject by a restrictive definition of the notion of a company that we will refer to as a ‘spin-off’.

- In Chapter 3, we clarify the role of the different stakeholders and parties in the course of the making of a spin-off; namely the government, the knowledge centers, the financiers and finally businesses and education.
- In Chapter 4, we will discuss more generally what can be gained from 'learning by experience' during the creation of spin-offs.
- Finally, in Chapter 5, we will consider some ethical and deontological issues.

2 What is a spin-off?

In this position paper we adopt a rather restrictive definition of spin-offs: these are companies originating out of a knowledge center, namely universities, colleges and strategic research centers (SRCs), and where an assessable contribution to intellectual property (i.e., technology, patents, software, know-how, etc.) is brought into the spin-off company. This implies that in many cases the founders, but also the knowledge centers, become shareholder in the company being established.

This restrictive definition means that companies that subsequently – i.e. after one's studies – are established by alumni or ex-researchers, and where no measurable contribution from the knowledge center is present, are not considered to be a spin-off. Indeed, these companies do create a significant economic activity and can have an economic impact that weighs many times heavier than the spin-offs '*sensu stricto*' defined here above.

Occasionally companies can rise out of a (large) enterprise through *demerger* (i.e. splitting the company's business and shares into a new business) or in collaboration with another enterprise in the form of a *joint venture*. Similarly these 'spin-outs' are beyond the scope of this position paper.

Finally, there is the recent phenomenon termed the '*spin-ins*', where a knowledge center acquires an equity stake in an existing company through a substantial contribution of intellectual property. Such '*spin-ins*' – although limited in number – will fall under the definition of '*spin-offs*' used here.

Thus, it is understood that a spin-off means a company (i.e. typically a corporation or other legal entity such as a private limited liability company (bvba, asbl) or non-profit organization (vzw, sprl) whose activities are aimed to valorize the intellectual assets of the knowledge center: scientific knowledge, the results of scientific research, technology, or even administrative and/or logistics innovations that were developed there. It also includes the legal acts that a knowledge institution made and where a substantial transfer of technology was needed in order to realize the spin-off.

The views diverge about when a spin-off is successful. To this respect, we base ourselves in the first place on social relevance: a spin-off is successful when its activities satisfy a societal demand, and is economically and socially profitable in a sustainable way. Under these conditions there is a successful transfer of 'knowledge generated' to 'knowledge valorized'.

Naturally, some additional criteria apply to the various actors that are involved in the spin-off process. Investors will expect a sufficiently large 'return-on-investment', the government will expect that the economic activity in a region expands with sufficient employment and growth, and the knowledge center expects a positive contribution to its reputation and prestige.

All these ambitions and expectations are relevant, but what really matters for society is that knowledge-created research is converted into products or services with an added value to society and that the spin-off can continue to grow with success.

A necessary, but not adequate on its own, condition for the success of a spin-off is its innovative character. The entrepreneur, who wants to exploit the results of scientific research and/or technology, must primarily ensure market innovation: a new product or service, a better variant or possibly a new business model of existing products or services. Innovation usually means that the spin-off is active in a market wider than the local market, and that internationalization (directly or over time) are part of the business plan. Innovation is not limited to technology: The company can also be innovative in its business model, in the marketing and '*branding*' of its products/services, in its dealings with customers, in the services it provides, etc.

A detailed market analysis already should be a part of the first version of the business plan and, among other things, should include how innovative a new product is compared to existing products. The key questions are: What new thing are we bringing into the market, and is this new product/service capable of, in time, becoming profitable and staying profitable? What is the market for this product/service? Does a market (or a segment of a market) still need to be created?

How does the market need to be reached? How will the 'return-on-investment' of the product/service be calculated by the customers in the targeted market segment, which is of importance for the pricing of the product/service? In other words, the establishment of a spin-off should not only be based on a '*technology-push*' approach, where the product or the technology is offered onto the market without more market research; but the establishment of a spin-off should also be based on the careful identification and exploration of a '*market-pull*' approach, where one identifies what the market actually wants.

Similarly, there will be many other hurdles to tackle at the same time. Sooner or later competition will emerge in the market place, which implies that the company will face an additional risk factor. Hence, companies should have the mission to act on innovation as every new product will have a limited life. The more innovative the product is, the stronger competitive advantage it will have on one hand, but on the other hand it might stimulate the competition depending on the strength of the intellectual property of the company. As a consequence, an innovative spin-off should continuously manage competition risk. There are also many counterexamples of companies, large and small, that stopped innovating when one or more of their products became a great success and as a result these companies came into difficulties through a lack of further innovation. As such, there have been many leading companies in the technology sector that were global leader for only a few years and were almost wiped off the map afterwards e.g. because they missed the *Smart Phone* revolution.

On the other hand, innovation cannot only stay purely technological, rather it should be a “state of mind” in the company with an impact on all aspects of the company structure and culture: the internal organization, the business model, the relationships with and among staff, the interaction with clients and suppliers, etc... Classic examples of this are companies such as Google, who prove their *innovative spirit* in all aspects of their company, and continue to enter into wider market segments. Likewise, Apple, with its *i-Phone*, brought not only a technological masterpiece onto the market but also introduced a new concept for communication. Moreover, Apple applied an innovative business model, with *Apps*, *iTunes* and even developed an innovative financial structure.

1 Societal climate and the actors

In order for a start-up company to arise from a knowledge center, the various requirements of scientific excellence need to be fulfilled: the opportunity to valorize the research and/or scientific knowledge or expertise on the basis of innovation in the sector and by means of a practical product or service.

Essential to this process is that:

- there is a market for what is being offered and that one can verify and validate the vision concerning the market potential of the product or service;
- the founder(s) possesse(s) sufficient knowledge to draft a business plan, to implement it, and persuade external investors. In other words, that the founder(s) are capable of making a correct assessment of the associated risks and ‘return-on-investment’.

The conditions for practically implementing a spin-off can be very different depending on the sector in which the spin-off will be active. There are important differences between the *life sciences* (i.e. biotech, pharma, diagnostics, and medical devices) and robotics, information and communication technology (ICT), the world of 3D-printing, etc... One thing all sectors have in common is: in order to succeed and grow, spin-offs need a stimulating environment that encourages individuals to become entrepreneurs and to convert ideas or research into products that can be put onto the market.

By stimulating environment, we do not mean the direct personal and familial environment of the starter, which can also be of great importance, but rather the societal climate as well as the economic and political climate. This environment is determined by several parties who can all play a major role in the start-up, e.g. the government, the universities and SRCs, the financial sector and the world of education.

According to a recent publication by the KBC (5), starting entrepreneurship is strongly influenced by ‘latent entrepreneurship’ (i.e. the desire to be self-employed and preparing to be self-employed). This phenomenon has also been cited in an article by the Flemish newspaper

'De Standaard' (6): *'Having the ambition to be an entrepreneur has a positive effect on the chance that you will actually become one. A survey from the European Commission indicates that Belgium, to this respect, scores poorly. Education will play an important role in turning this tide: A world of difference can be made by sharpening the self-confidence, creativity and broadmindedness of young people; and by getting these individuals acquainted with the reality of entrepreneurship. The lack of entrepreneurship in Belgium is probably also partly explained by the assumption that the working citizen is already sitting in a prosperous 'comfort zone', which is co-maintained by provisions in the social security system. The preference of falling under an employee status for reasons of social security in turn explains why Belgium when compared to other countries scores well in terms of 'intrapreneurship'. The rate of Belgian employees, who are viewed as 'intrapreneur', would be 14% as compared to the 10% average in Europe. Thus, Belgium is in the leading group.'*

3.1 Government creates the preconditions for entrepreneurship

The increasing interest in Europe that is attached to the establishment of spin-offs has a barely hidden relationship with the success of *Silicon Valley* (US), of the area of Boston (US) and of both Cambridge's (US and UK): these are the choice points of excellence for comparison of regions with successful entrepreneurship. Significant financial support at a European level is foreseen for establishing such an ecosystem; Flanders is also fully committed to establishing a spin-off ecosystem. However, the spin-off model and process followed for potential success have not been fully crystalized.

The comparison to the aforementioned reference points only partly holds true because in these foreign regions, for example, less spin-offs have been created directly from knowledge centers and more from companies or by PhD students from Stanford, Berkeley, UCLA, MIT, Harvard, etc... The biotope in *Silicon Valley* and similar regions includes much more than just the spin-offs that meet the restrictive definition we use in this position paper.

If one in Europe really wants to emulate the success of *Silicon Valley*, then first and foremost, governments must create the necessary preconditions as there are significant differences between the American and European realities. This point will be discussed further below.

According to the *European Commission Communication about industrial policy* of 2012 (7), there is a clear difference in entrepreneurship between the USA and Europe: *'Europe lags behind its competitors in entrepreneurial attitudes and SMEs, which are the biggest source of new jobs and related growth. A European Entrepreneurship Action Plan is needed to address areas where entrepreneurial potential can be unleashed and where key bottlenecks can be overcome and obstacles to entrepreneurial activities removed.'*

Moreover: *'Education for entrepreneurship can make a difference as young people who go through entrepreneurial programmes and activities start more companies and earlier – the percentage of alumni who become entrepreneurs 3 to 5 years after leaving school is 3-5%, whereas for those who participated in any entrepreneurship education this percentage rises to 15-20%. ... Raising awareness of government*

administrations and their staff about entrepreneurial and SME challenges generated a major interest amongst the respondents as more than 64% rated this measure as very important. 52% of all respondents consider “improve the quality and variety of business support advice for start-ups” a very important measure and only 12% rate it as not very impactful.’

Finally: ‘Awareness-raising in the business and finance community to remove the stigma of failure. ... About 50% of new businesses fail during their first five years, the so-called ‘valley of death’ of business development. To achieve the increased economic growth rates targeted by Europe for 2020, it is vital to increase the resilience and competitiveness of these firms.’

The different governments can and should play an important role in promoting a “culture” of entrepreneurship, and particularly in advancing the start-up of spin-offs. Promotion ranges from developing and encouraging certain forms of behavior and consumption patterns by organizations and citizens to regulating the market, including correcting market failures (which is certainly an issue being questioned now in the United States).

However, promotion is still more about direct measures such as encouraging or inhibiting entrepreneurship through financial and fiscal measures, labor costs, subsidies and other support oriented measures; similarly, it is also about indirect measures by other actors such as educational networks, specific campaigns, and research institutes.

In addition, promotion refers to government communication and patronization, where the entrepreneur can be viewed to as either a hero or a scapegoat. It is about the ‘why’ or the ‘why not’ question that every entrepreneur asks himself/herself before he/she begins the endeavor.

As mentioned previously, the government plays a crucial role in creating and maintaining a social climate that stimulates entrepreneurship and brings it into a positive light, and in creating or dismantling markets, such as in the recent discussion on whether or not to subsidize solar panels, windmills, solar water heaters, etc. Important to this policy is the quality and integrity of the people in key positions in government institutions who serve to stimulate and support innovation and entrepreneurship.

Other parties, which we will speak more on later, are dependent on the government because the success of their contribution to the creation of enterprises and the stimulation of individuals to become entrepreneurs are partially dependent on the prevailing social climate and the legislation. This situation was never more clearly illustrated than at the time of *Flanders Technology* (8) from the former Chairman of the Flemish Executive (government) – Gaston Geens, who managed to set up a societal climate that called for both action and support of innovation. This call created a ‘*can do*’ attitude, together with the *Technology Days* and the biennial conferences where the public at large could experience innovation. The population became familiar with and enthusiastic about innovation and new technology by spotlighting it together with its applications, whether

these applications were potential or real. At the same time, a platform was built to attract and compare investors internationally.

Stable tax laws and fair treatment of the entrepreneur are extremely important elements for stimulating the business environment. Continuity is indeed important when taking long term decisions such as starting up an enterprise, making investments, attracting personnel (which also is a form of long-term investment), and choosing a financial strategy for financing a company.

To this respect, the government has a crucial role. Meanwhile the European Commission has estimated that the total tax burden in Belgium is the second highest in the European Union (after Denmark) and amounts to 45.4% of the gross national product. This tax burden is particularly high on labor, but also on capital, but less on consumption and pollution (9). One consolation for entrepreneurs it that in Belgium there is no capital gains tax on shares.

Government creates the preconditions for successful entrepreneurship. Politicians and other policy makers should create an environment that better values entrepreneurship, brings it positively into the spotlight and promotes it. In order to create this environment, new instruments should be developed alongside existing ones such that entrepreneurship can be achieved in a relatively short period of time. Due to the high quality of our knowledge centers, we do have a large potential source of innovative entrepreneurs available.

In addition, the **administrative costs** for a company, as well as the **social security costs** borne by the company for employees in Belgium are higher and even much higher than abroad, including neighboring countries. Entrepreneurs make it an issue to tell their employees that it is not them but rather the government who skims off too much of the total personnel cost of a company.

KBC economist Koen De Leus presents a similar view in a recent article (10) published in the Flemish newspaper 'Gazet van Antwerpen'. According to De Leus, it does not even need to cost the government money if they reduced the administrative costs for SMEs. Administrative costs are indeed high, according to research of the European Commission in the effort it takes in other European countries to start a company (11). Gallup showed in a study that 58% of Belgian starters think that the government makes it difficult for them to establish a business; while only 27% of Belgian starters found the government to not be an obstacle. Moreover, this study showed that most Belgians still see entrepreneurs as role models, although that cannot be considered always and everywhere as an established fact.

It is clear that the **international competitiveness** of our companies suffers because of this, especially because other comparable countries perform much better on all of these aspects. Flanders has sunk in the European Innovation Ranking in the bi-annual innovation report of the European Commission, published in March 2014 for the period 2006-2013 (12). 'De Standaard' on March 5, 2014 reported that Belgium is an innovation follower and not an innovation leader;

additionally the growth rate in the past years has been lower than in most other EU-countries. As no distinction is made between regions in Belgium, it was decided that Flanders does not belong to the leading group of top 34 regions, and that Flanders is even slowly losing ground to Brussels and Wallonia.

Also important are the **lack of flexibility in employment initiatives** and the **high cost of laying off employees**. In Belgium a company can grow, but when the results are disappointing, the company almost goes bankrupt as it cannot shrink. Recently new legislation has been worked on and there may be improvement coming in the form of limiting severance payments.

Equally important is that the public administration is encouraged to better understand entrepreneurs and innovation, take them seriously, and to help them with the administrative steps needed to set up a company. That is certainly the case for spin-offs where innovation and entrepreneurship meet *par excellence*. It is really a shame that so much paperwork is required in order to start up a company.

Similarly an application for a grant to IWT (Agency for Innovation by Science and Technology in Flanders) or to the European Commission requires that masses of documents be filled in combined with the promise of a return on investment that is not always realistic. This situation creates performance anxiety and a negative climate should the project fail. This in turn makes entrepreneurs doubt if they should resubmit projects, while failure should rather be considered as an experience.

Appreciation for the entrepreneur must also be reflected in the form and administrative procedures of governmental records.

Political leadership, in acknowledging the value of the entrepreneur and entrepreneurship, is extremely important for the proper societal climate and for ethics. Entrepreneurs cannot start up, let alone function, in a too negative climate in which envy and negativity sets the tone. It is up to the government to show society that entrepreneurs are important and meaningful for everybody, create employment and societal wealth, and hold a creative function in society. Hence, the decision of the Federal government to increase the liquidation bonus from 10% to 25% gave a wrong signal to entrepreneurs and was not particularly stimulating for entrepreneurship.

The importance of the social climate for entrepreneurs and spin-offs is moreover strongly emphasized in many publications from the European Commission with the related conclusions. Hereabouts, in recent texts it has been clearly illustrated:

'Small firms depend on entrepreneurs - the individuals who have the ideas and are willing to take the risks necessary to get a firm off the ground. Europe needs more entrepreneurs and the Commission is looking at ways in which potential entrepreneurs may be encouraged to set up firms.' (13).

Additional: *‘The Entrepreneurship and Innovation Programme (EIP) supports activities aimed at fostering entrepreneurship culture and creating better framework conditions for SMEs operating in EU.’* (14)

For this reason in the beginning of 2013, the *Entrepreneurship 2020 Action Plan* was introduced: with a positive message about *‘creation of an environment where entrepreneurs can flourish and grow* (15). ‘

A totally new initiative for SME’s was introduced in the EU Horizon 2020 Program, that is aimed at innovative SME’s and start-up companies, which follows the example of the successful *Small Business Innovation Research (SBIR) in the United States: “Horizon 2020 actively supports SMEs by providing both direct financial support, and indirect support to increase their innovation capacity. Innovation in SMEs’ aims at creating a bridge between the core of the framework program - support to research, development and innovation projects - and the creation of a favorable ecosystem for SME innovation and growth.”* (16).

These measures would best be taken to heart by the innovative spin-offs in order to confront project holders on a European scale with potential competition and other ideas, and to gain a critical evaluation from international experts, which could prove very useful even if their file were to be withheld.

3.2 Knowledge Centers: from top talent to high-tech entrepreneurs

The impact of knowledge centers on the economic activity of a region is, on the contrary, not questioned. Domestically this is the case for different regions. The region around the city of Leuven is a good example of this and several highly successful spin-offs have been created. Similarly, the region around Ghent shows to have some very fruitful spin-offs as well, especially in biotech.

However spin-offs are only a relatively recent phenomenon in Flanders. Only since the 1960’s have universities stepped out of their ivory towers and have begun increasingly to interact with society and industry. Only since the 1980’s and 1990’s have the number of spin-offs been able to take a higher flight path driven by the education of a growing cohort of highly-trained individuals and by supplying excellent human resources.

Academic institutions, from various university decrees, are commissioned to take up roles in research, teaching as well as a role in society. Moreover, since 1995, there is a ‘decree on services’ that among other things regulate by decree the creation of spin-off companies via so named ‘interfaces’. One should not lose sight of the fact that spin-off creation is not the only task of the interfaces (i.e. the *‘technology-transfer-offices’* (TTOs)) of a university.

Indeed, contract research with companies (directly through bilateral projects or indirectly through IWT or European projects) is, in terms of financing, many times more important for knowledge centers than revenues derived from spin-offs. In other words, the direct interaction with the business community in the area of R&D is obviously just as important to a technology transfer office as to the creation of spin-off companies.

Our knowledge centers (universities, colleges and strategic research centers) provide top talent with a spirit of enterprise. The instruments for spin-off creation in our knowledge centers have been well-developed in the meantime. Talent for entrepreneurship should be best actively scouted within the vast talent pools that have arisen in the last decades from the greatly increased financing of research. Investment in this talent, combined with intensive coaching will ensure that individuals, particularly young people, who possess the appropriate skills to actively participate in a spin-off, actually get a chance.

All the same our universities are quite successful in the area of spin-off creation. For example, the counter has stood at 100 spin-off companies since 1980 at the KU Leuven university. A survey by the law firm NautaDutilh of ten Belgian universities (both Dutch and French speaking) about the plans of their researchers to commercialize innovation via an own company showed that the pipeline in the near future looks promising (17). Each of the ten institutions thinks that they will launch one or more spin-offs by 2014, which would account for a total of 35 new companies (i.e. 7-10 at the Ghent University and about 10 at the KU Leuven university). It should be mentioned that these are mainly ICT-companies to be formed. However, from universities, also several start-up companies in the biotech, diagnostic and medical equipment sectors are in the making. According to the universities, that trend is thanks to the Flemish Institute for Biotechnology (VIB), which is the inter-university collaborative partnership with funding from the Flemish government.

In the next five years, the KU Leuven hopes to create 40-50 new spin-offs and Ghent university 35-45. Koenraad Debackere, managing director of *KU Leuven Research & Development*, confirms that; *'The sectors to watch in the coming years are life sciences (e.g. biotech and pharma) and everything that deals with 3D-printing, robotics and ICT'. 'We cannot complain about new ideas. It is up to scientists to be motivated to take a double risk: taking the step from researcher to entrepreneur and making the financial engagement associated with starting up a company'.*

Moreover, one finds in the management agreement of the strategic research centers (SRCs) a clause that punishes them (by limiting their annual funds) for not producing a sufficient number of spin-offs within a given period. That is one of the reasons why the start-up of spin-offs is an important priority to institutes such as imec, i-Minds, VIB and VITO.

According to Director Johan Cardoen of VIB (18), the Flemish Institute for Biotechnology has established approximately one spin-off every year since its founding; the counter now stands at 13 companies. Projects in the biotechnology sector usually require longer incubation periods and a larger amount of start capital than a project starting in the ICT sector for example. imec has founded more than 35 spin-offs since its establishment and VITO around 9 spin-offs.

Increasingly, universities as well as SRCs have been professionally equipped for **guiding spin-offs**. For example, it is a challenge for newly formed spin-offs to find a suitable CEO. The ‘pool’ of entrepreneurs from which a CEO can be recruited is relatively small. The role of the university or SCC is not necessarily finished once the initial funding is found and the spin-off is launched: often these organizations still play an important role in the board of directors or in the operations of the company (i.e. mediation in conflicts between shareholders, or between founders and financiers, administrative support, interaction in the field of research projects, etc.)

A new major trend is the **establishment and development of incubators**. One can find various types of incubators designed to support spin-offs further, which are established by universities, SRCs, regions or cities. There are classic incubators where not only spin-offs but also other start-ups can receive general support and accommodation. Often spin-offs experience specific problems such as access to specific databases, testing equipment, bio-systems, etc. Universities, SRCs, and provincial and Flemish initiatives seek to meet these requirements by building and making specific incubators available. Examples of such incubators include the bio-incubator of the VIB in Hasselt, the cleantech-incubator in Greenville (Houthalen), Innotek in Mol, Thorpark in Genk, the bio-incubator in Leuven to name a few.

Incubation is also important because not only market potential is necessary but also a proven track record that allows for uncertainties in the business plan to be better substantiated; this importance stems from the need to have a good business plan that can be externally validated for funding. For spin-offs in capital-intensive sectors, funding is not always possible because it can take a long time before a first product is ready for market. In some cases, funding issues can be dealt with by financial resources originating from industrial partners or entrepreneurs, in other cases this can be dealt with by a longer incubation period that allows for ideas to be better and more thoroughly worked out.

Longer incubation? Knowledge centers should develop, where appropriate together, a policy that allows for longer incubation periods such that the social and economic impact of the spin-offs substantially increases and the risk of failure is reduced.

A very important “parameter” in the spin-off process is the question, ‘At which moment should the transition be made from the pre-incubation process to the actual founding of the company? Generally speaking, this step may have been taken too quickly in the past leading to a high percentage of failures. Therefore, it has to be recommended that knowledge centers

incubate their spin-offs longer in order to increase the chance of success in the market. A longer incubation period can aim at several goals:

Firstly, the market should be tested effectively and the business plan should be tested for its sense of reality. By doing this, the start-up team can be coached and the product improved. The knowledge center should therefore be equipped with the necessary (personnel and financial) resources to make such longer incubation periods possible. In fact, the knowledge center acts a while as an industrial player in an existing or future market. This position requires not only transparency but also adaptation. In Flanders, this scenario is sometimes “condemned”, but abroad it is mostly encouraged. Of course, appropriate structures and agreements are indicated. These structures and agreements need a clear deontology, for example related to price setting and the length of the experiment. The management agreement with the SRCs should also contain deontological elements for the directors and members of the executive board and the obligation, also from European institutions, to cover costs and be competitive.

In addition, knowledge centers can benefit from the creation of successful spin-offs, if they can maintain a share in the company long enough.

Hence, it is recommended that a possible spin-off be allowed to incubate sufficiently long in the knowledge center until an adequate market potential can be shown. In this incubation period and during the start-up process, the spin-off team can also be coached such that, subsequently, the spin-off can be shaped successfully. This shaping requires that the knowledge center should be mandated to do so, with access to specific resources (e.g. SOFI-funds), and in addition specific deontological and financial rules are needed. These resources should namely avoid that such incubating spin-offs disrupt markets through lack of market knowledge or the regulations. Knowledge centers should certainly not establish spin-offs and then continue to support them with diverse indirect resources for the sake of their own funding or for decorating their figures.

An example of where longer incubation periods have been applied is in the biotechnology sector (e.g. VIB) whereby spin-offs experience an incubation period of several years, even up to ten years, before they can be established as an independent legal entity (18). Similarly the guidance and possibly longer incubation period of the spin-off is an important societal role of the knowledge center because the survival rate of the spin-off may decrease considerably with too rapid independence. However, a spin-off should not incubate ‘too long’ because the entrepreneur should ‘jump in the water’ as soon as possible in order to feel and play the market without being constantly breast fed by the ‘mother-institution’.

3.3 Financiers: a diversified package of investment instruments

In addition to their role during the preparation and incubation period, the knowledge centers are important in attracting the correct financiers (i.e. partners who will also participate in a second or third financing round). Not only are knowledge centers often co-financiers, or by definition knowledge contributors, but in some cases they may also have their own seed funds that can be co-invested in the spin-off.

Recently the Flemish government has created a rolling financing fund (i.e. SOFI) in order to further support the financial investment of the SRCs in spin-offs. SOFI provides venture capital to help companies in the start-up phase. From SOFI I, a number of spin-offs have been established since mid-2011. In order to keep this momentum going, there was even an additional 10 million euro reserved for SOFI II by the Minister in charge at the end of 2013.

However in all regions, countries and also at a European level, there exist numerous financial agencies or structures that can financially help start-up companies or are willing to take a stake in the company.

In Flanders, there is the GIMV that has evolved from a venture capitalist for starters to a financier for companies who want to grow further, not only in Flanders but also in Europe. Besides them, there are other financial actors for specific niches that are important in Flanders. Examples of these are *Capricorn Venture Partners* (active in clean technology, ICT and health technology), *Biovest* (who became a major investor in biotechnology), *Big Bang Ventures*, and many others. Likewise there are other consequential sources of financing such as familial investors, the Flemish Business Angels platform and the classic 'fff' (*friends, fools and family*).

Financiers offer a diversified package of investment vehicles, but gaps remain.

Gradually, a large range of investment funds exist in Flanders that spinoffs can tap into: government (SOFI, GIMV, PMV, IWT, Agentschap Ondernemen), knowledge centers (seed funding) and 'private' investors. Nonetheless there are gaps in the investment landscape, namely there is a need for growth funds to, for example, survive '*the valley of death*' or to enter the global world market.

Finally, there are also specific funds associated to universities. The KU Leuven has its own seed fund, the *Gemma Frisius* fund, set up together with several banks. Other universities have followed this example. Some universities have established funds, together with VITO Qbic and with the support of banks such as the KBC, to help finance spin-off activities. Also imec supports the establishment of spin-offs via its sister company FIDIMEC NV. The VIB has its own 'Technology Fund' where, via (dis)investment committees, stakes in spin-offs can be built up or dismantled.

The VIB decided recently to establish a separate 'VIB Venture Fund' together with the European Investment Fund. Moreover, the European Investment Fund can be a very interesting

partner: *'EIF delivers a wide range of innovative financing solutions for micro, small and medium-sized enterprises (SMEs) throughout Europe. These solutions, including equity, guarantees, credit enhancement and microfinance, are delivered through financial intermediaries. Constantly adapting to changing market needs, EIF plays a countercyclical role in times of economic crisis.'* (19)

Besides the funding necessary to facilitate the creation of a spin-off, additional investment resources are often needed afterwards to subsequently provide for growth. PMV (Participatiemaatschappij Vlaanderen) has created the Mezzanine Fund for this purpose. In general, the financing of spin-off growth still poses a problem and for this segment of growers there is certainly still insufficient capital available to them. These growers are often confronted with what is termed *'the Valley of Death'*, namely the period and management in which an initial product or service has proven its value as compared to the moment of definitive and global breakthrough. It is in this period when growth capital is scarce, that Flemish companies in general, and spin-offs in particular, lack sufficient capital leverage to survive this *'Valley of Death'*.

A good business plan is a *'conditio sine qua non'* for financiers to participate in a company.

Therefore, knowledge centers have recently developed extensive experience in setting up appropriate business plans, both to define market potential as well as to attract investors. As such it has been agreed to, within SOFI for example, that a uniform approach for writing business plans for spin-offs of SRCs be applied. If the spin-off should fail, there should be little correlation to an insufficiently developed or motivated business plan, but rather an absence of something else on the side of the entrepreneur(s).

There can possibly be a relationship between the business growth of spin-offs and the origin of the financial resources (i.e. financial capital). The success rate appears to be higher when capital is provided by industrial entrepreneurs when compared to purely financial shareholders. Similarly spin-offs from the *Life Sciences* sector (e.g. VIB spin-offs) have a better success rate, probably due to both a longer incubation period combined with industrial shareholders or at least shareholders who know the sector well and can properly estimate the risks.

3.4 Education: Attention to the social role of entrepreneurs and enterprises

The success of spin-offs depends on many factors; one of the most important is undoubtedly the quality of the core team of the start-up. One should therefore ask themselves which approach should be adopted to ensure that researchers, who take the step to establish a spin-off, are optimally prepared. This preparation begins early on and ends with a specific coaching, often in the knowledge center, leading up to the establishment of the company. The importance of education, training and coaching can hardly be overestimated and measures to create a spin-off friendly climate should largely be focused on education, at all possible levels and from an early age.

3.4.1 Primary and secondary education and interaction with the business world

In a long process of about 15 years, starting with kindergarten and ending on leaving secondary school, children and young people build step by step an image of how society functions and what role companies play in society. They slowly but surely become conscious that virtually all products and many services that they use are provided for by companies ranging from a sole proprietorship (e.g. the baker) to a large multinational (e.g. a pharmaceutical company). They become aware of the fact that some products and services are produced locally while others come from abroad. They get a notion that the trade balance of a region, country or continent should be somewhat in balance. They learn that companies need to invest in the future and take risks. They begin to realize that entrepreneurship plays a critical role in the prosperity and welfare of the society in which they live. What is also essential during the first 12 years of education is to create a climate in which young people through coaching can learn to take risks, and where a possible failure does not mean defeat but is rather a starting point to try again.

Significant efforts have already been made on all levels of education to give young people insight and teach them a number of associated knowledge elements. An intrinsic obstacle is that most teachers themselves have had little chance to be in contact with companies or with entrepreneurship in general. This means that teachers have little affinity with this theme and hence are less able to teach about it through personal experience. This problem can be somewhat resolved by, in as much as possible inviting entrepreneurs as guest speakers and by company visits, but practically speaking it cannot be expected that this approach will alleviate all problems. Another approach would be that teachers, who are open to this, are given the possibility to build business experience by doing an internship or maybe even by taking a sabbatical. In this way, they could become the central figure within their school for all possible education initiatives about entrepreneurship.

Education, at some levels, already pays attention to the societal role of entrepreneurs and enterprises. A sense of entrepreneurship and taking business risks deserves attention at all levels of education (i.e. primary, secondary and higher education), and should be worked into the curriculum as experience-based as possible.

It is very important in all of this that attention is paid to the explicit and implicit ethical dimension of entrepreneurship. Attention should also be paid to the societal role of entrepreneurship, to corporate sustainability and social responsibility.

Teaching young people to develop a critical look, where they are somewhat able to form a level-headed opinion about the value of a company to society, will allow these young people to recognize both good and bad examples of entrepreneurship (see Chapter 5 for more information).

Now more than ever has been the case, it is important that the business world also be a part of education and both parties should be committed to presenting the dimension of entrepreneurship and entrepreneurs to students.

3.4.2 Higher education at a bachelor and master level

In order to encourage entrepreneurship, it is necessary that in higher education, entrepreneurship be explicitly and stimulatingly offered in almost every study program but it should not be mandatory: especially in science (the study of natural processes), but also in humanities and social sciences (respectively the study of human constructs and the study of social relations). Where the educational approach about entrepreneurship in primary and secondary education would be to some extent experience based – otherwise it would be very difficult to make this abstract matter fascinating to students – a thorough study of the different aspects of entrepreneurship can be started in higher education. But even at this level of education, it is important to not wait too long before concrete case studies are introduced.

It is recommended that a number of elective courses related to entrepreneurship be offered to interested and motivated students, where students can gain deeper knowledge and advance his/her skills. In this way all kinds of opportunities are afforded to students to address real-life case studies with businesses and have a possibility to write a business plan. These opportunities can lead to a valuable win-win situation between the university or college and businesses, where students eventually can even provide innovative ideas to the businesses involved.

Conversely, companies can deliver a real contribution to the education process on entrepreneurship. It goes without saying that company internships are a very useful addition to the range of educational activities to this respect.

Attention to the elements of doing business, including the ethical dimension, should continue unabated at the higher education level. Students should be able to form an opinion, in a methodological way, of what it means in a concrete context to be an entrepreneur with corporate social responsibility.

3.4.3 Coaching and scouting for researchers with respect to spin-off oriented entrepreneurship

The research groups in the knowledge centers form logical habitats in which spin-off initiatives can arise. It is there within these groups of researchers that the spin-off entrepreneurs of tomorrow will be found.

In the last decades, universities have contributed to the education of a significantly increasing group of talent individuals, including a greatly increasing number of PhD students and postdoctoral researchers. It is not possible for all these individuals to continue to be employed

within universities or colleges and as such these postdoctoral students will need to find their way more and more to industry and government administration. The creation of or participation in a spin-off is one way, and possibly a very useful way, in which these individuals' knowledge can continue to be put to effective use. Bringing this group of talent into contact with experienced entrepreneurs and companies may, to this respect, bring a significant contribution to society.

Increasingly, “*doctoral schools*” are also playing an important role. As such, more and more courses about ‘valorization’ are being offered where valorization means ensuring that knowledge which has been developed at a university is put to effect use, by translating it into economically productive activity. Efforts are being made to develop an ecosystem to recognize ‘high potentials’ in research and to direct their talent to the development of spin-offs. To this point and among others, the Industrial Research Fund (IRF) at different universities has played a leading role.

In the last few years, a network of IRF mandate holders has been charted, who each in their domain will develop business activities (i.e. be responsible for ‘*business development*’). This could lead to a kind of “*spin-off academy*” that thoroughly selects talent and coaches them for one year (e.g. the recent path of INNOTEK (20), Flanders-wide). Universities and colleges can provide a framework for this purpose, possibly with coaching from captains of industry. An important element in this framework is the search for and promotion of the initiative of the high potentials themselves. *A mind is a terrible thing to waste.*

Similarly, numerical studies from the American *Kauffman Foundation* (21) point out that training individuals is a very important way in which the public sector can contribute to entrepreneurship and the development of the regional economy. This think tank particularly focuses on start-ups. A similar conclusion was made in a literature review by the *European Network on Economics of Education (ENEE)*, which also states that there is evidence that universities can contribute in more than one way to innovation and regional growth than what happens today. It appears that the optimal approach varies by university and by region (22).

Universities undertake many initiatives to give entrepreneurs a broader base. Good examples of this can be found in a new publication from the *League of European Research Universities (LERU)* (23). This publication also contains recommendations for employers, governments and financiers.

Times Higher Education (THE) states that France is adding employability of its graduates on the labor market to its mission of its universities (24).

Last but not least, university alumni and their related associations can contribute to the social climate and can via their networks be themselves instrumental for young entrepreneurs. Alumni are embedded at all levels of society and this group includes many successful entrepreneurs and managers. These alumni can also contribute to the educational programs of young entrepreneurs, especially where business advice from ‘experts’ is concerned. Likewise, contribution can be made through exemplary functions and by using the experience of individuals who work in politics,

government or at the trade unions. However, there is currently no structure that allows for the optimal use of transferring their knowledge and experience.

Obviously alumni can be active as capital providers but they can also be active in the field of internationalization. Our universities account for a growing number of alumni in economically powerful centers and represent a wealth of networking opportunities that are at the moment hardly tapped into.

Similarly company associations can assist with the promotion and promulgation of entrepreneurship. EuropaBio, the European association of companies in the sector of Life Sciences, offers an annual award for the *Most Innovative European Biotech Small and Medium-sized Enterprise* which was won in 2013 by the company PsiOxus Therapeutics in Oxford, UK. EuropaBio's press release (25) states: '*The award presented during the first ever European Biotechnology Week discussed Europe's future in the global biotech sector, and whether Europe is equipping itself with the right policy framework to encourage innovation, and importantly, retain it.*'

4 Learning from experience

"There is no bible that can lead a company successfully to a spin-off. Nor is there a book to buy at the bookstore about the magical seven signs to success. Spin-offs do not disguise themselves as manna that effortlessly falls from the sky. Creating a spin-off is mainly a passion, a belief in the spin-off team and hard work. The INNOTEK-coaches can facilitate the spin-off process in a number of ways, but it is the company that needs to roll up its sleeves". (26)

There is certainly no lack of opportunities within Flemish society. In many companies ideas for new initiatives are up for grabs, but one must be able to activate the process.

As far as universities are concerned, there finality should not be reduced to mere economic interests. According to Geert Noels (Econopolis) (27), the leveraging effect of universities has an increasingly determining effect on prosperity of the economy in a whole region. Graduates of universities do not lack knowledge, but rather little blood for entrepreneurship flows through their veins. We are doing everything to encourage the group of individuals, who possess the correct entrepreneur mix, to maximally provide them with starter money, coaching or incubation in order to let a successful spin-off grow.

A spin-off begins with an opportunity, a chance. Mark Twain wrote once: "*I was seldom able to see an opportunity until it had ceased to be one*". Just like Mark Twain, people often see the chance only as it has passed by. However, by then, the "*window of opportunity*" has closed.

Similarly, according to Jos Peeters (Capricorn Venture Partners), the most important ingredient for success is the team that works on the spin-off including a clear plan and estimation

of the risks of the project. Due to the fact that there are not enough skilled people in a particular sector (e.g. a shortage of skilled personnel in the ICT market), products are not delivered on time or projects are not delivered with the deadline. Sometimes risks are just not accounted for, poorly estimated, not accepted as such or poorly managed (28).

In addition, the way in which we look at a project is very important. Entrepreneurs often have the end goal in mind and as such they are able to break through complexity and avoid problems.

For the business plan, it is very important to know when one is threatened to hit a dead end and knowing what should be done to get back on track. Entrepreneurs have to be persistent on the one hand, but on the other hand they have to be able to improvise and adjust flexibly their plans as the odds and opportunities change. Planning cannot be simplified directly, but indirectly planning has often been improved through the creation of better processes. In many cases companies have set up shorter development cycles that are easier to plan and manage.

Failure and making mistakes should not be a problem so long as one learns. Innovation and starting a business implies that risks must be taken. Consequently, making mistakes is an essential part of doing business, and that should be more and better recognized.

Innovation and entrepreneurship means that risks must be taken. Making mistakes is consequently an essential part of entrepreneurship and that should be recognized more. One learns by making mistakes. If one does not occasionally fail, one may not be taking enough risks.

Is failure a problem? Not if one learns from their mistakes (e.g. the entrepreneur who understands that his/her idea is not affording the expected opportunity, and he/she can adjust his/her plans in order to avoid unnecessary risk). If work is organized in a structured way by constantly improving processes, additional risks can quickly be identified and reduced. Additional risks can be identified quickly and handled effectively by receiving frequent feedback (i.e. holding daily or weekly meetings).

Not every spin-off opportunity becomes reality. Reasons include: the management team is insufficiently professional, the financing is too long in coming, there is a lack of time due to insufficient prioritization, and there is little perseverance. The market can also suddenly disappear and one did not see that coming.

Experience with spin-offs from the world of venture capital indicates that the success rate is about 1 in 10 for a successful spin-off story: That is according to their definition of success because 20% of the spin-offs fairly rapidly fail after start up and the others remain more or less the size of a (large) SME. In light of the venture capital definition of 'success' of a spin-off, one can debate if such a company can really be considered as a failure. Nonetheless, the focus should

be on optimizing success and not limiting failure: innovation is simply Darwinian and failures are an intrinsic part of the process.

Finally, it is sometimes difficult to get a clear picture of the objectives. People (especially users) cannot imagine the outcome of a project and only after the outcome is there, do the objectives become clearer. It helps to invest more time in the development of clear objectives, and forces people to think about the processes.

At the time of the new industrial revolution, there were aside from the economic problems also new opportunities. This is illustrated aptly by Prof. Mazzucato in the article below:

Startup myths and obsessions by Mariana Mazzucato, Professor in the Economics of Innovation, University of Sussex (29):

The Entrepreneurial State: debunking private vs. public sector myth,

“The startup boom, she says, is partly a result of the lack of high quality jobs in the “old economy”. But it is also a result of policies based on myths around entrepreneurship and startups”.

“Innovation-led “smart” growth has occurred mainly in countries with a big group of medium to large companies, and a small group of SMEs that is spun out from some of those large companies or from universities. These firms have benefited immensely from government funded research. Every technology that makes the iPhone smart was government-funded (internet, GPS, touch-screen display, SIRI). Apple spends relatively little on R&D compared with other IT firms precisely because it uses existing technology. It applies its remarkable design skills to these technologies, effectively surfing on a government-funded wave”.

“Indeed, another obsession in the world of startups is venture capital and its role in nurturing innovation. Yet Silicon Valley firms were initially not funded mainly by venture capital. It came in after the ball had got rolling thanks to funding by the Department of Defense, the Department of Health and, more recently, the Department of Energy”.

“Startups in the emerging green innovation ecosystem will likely thrive in those countries where the public sector is able and willing to fund the high-risk investments that create the technologies and platforms which startups can then thrive on. And as private finance has retreated from financing the real economy, preferring to finance itself, the role of such public financial institutions is only growing. But not everywhere—and this is what will very likely differentiate the impact of startups across the world. It is very likely that startups will be more successful in the few countries that have resisted pressures to cut publicly funded R&D, such as Germany, which has increased the amount since 2009 by 20%, or China that has increased R&D spending by 170% over the last 10 years”.

Entrepreneurs as examples

Example of entrepreneurs in a country and in a sector can help to build a social framework for entrepreneurship in the sectors. Similarly business associations that support entrepreneurship can be of great importance to entrepreneurship and can help to give the right message to the (political) government.

Companies should not limit themselves to their own country. Internationalization is important. The sale of the first product – tPA – for dissolving blood clots during heart failure gave Professor Collen the chance to set up a spin-off, with the proceeds in Flanders, with all its ups and downs.

Professor Desiré Collen (extracts from an article by Jan De Schamphelaere in 'De Tijd' dated 28 December 2013 – (30)):

Don't call me an entrepreneur. I am a lost academic. I have known success, but also failure. Desiré Collen, top scientist and founder of Thrombogenics, pulled definitively the door closed in the beginning of December on his biotech company. The end of his career. 'I had no use anymore. 'Desiré Collen invested 70 million euros in Thrombogenics and built it into a company that is now worth 660 million euro on the stock market. In my company, I had as an academic all the freedom to do what I wanted to do. I didn't have to dance to anybody else's tune'. Nonetheless, you as an academic still decided to become an entrepreneur and founded Thrombogenics. Collen: 'I know that people want to paste the label of entrepreneur on me. But actually I am a lost academic. Many things in life are coincidence. Serendipity. I came to Leuven to become a house doctor but I rolled into research. I never felt a calling to set-up a company. But because of circumstances, it could not be otherwise.'

'I am perhaps a little pathetic, but I am concerned with the future of our children and grandchildren. We have to ensure that we can develop our own technology here. But for start-ups there is not enough money. That is an issue. Because, the future of Belgium will still be played in sectors such as mine and not in the manufacturing of cars. We have to ensure that it doesn't become a desert here. I realize that LSRP isn't the only solution. The amounts are small. But that seed money is so important. It is then that major risks are taken. There aren't that many investors who still want to do that. We are still waiting for the Belgian pharmaceutical sector to settle themselves in the United States.. That's where the money is. It is there that in the last year every week another biotech company went public. There is a tradition of risk taking there. The pioneers who traveled west in covered wagons; that spirit is still present.'

An entrepreneur is a visionary and has to see the market coming, but is not always a manager. Team work can be the solution.

Professor Charles Hirsch and Marc Tombroff (extracts from an article, translated from French, out of an article by Melanie Geelkens in 'Trends-Tendances' dated 13 October 2013 – (31))

Charles Hirsch and Marc Tombroff celebrate this year not only the 20th anniversary of their enterprise - Numeca, they are also celebrating 20 years of collaboration: a professional collaboration that has passed the test of time. Their career paths are inextricably linked to Numeca, a spin-off of the VUB for the development of software for simulation of fluid mechanics. Marc was my first student at the ULB, Charles Hirsch remembers: 'The conversion of software for research into an industrial product was very complex and I was looking for an engineer who was ready to take that risk' ... Numeca experienced every year double digit growth for several years. Today, the company has 120 employees worldwide, including 85 in Brussels. In 1998, the company began its transformation to greater professionalism. Charles Hirsch remained chairman and provided the major strategic lines, but all the big decisions were done together with Marc Tombroff, Director General. Hirsch says: 'From the beginning our understanding of each other was excellent. Such understanding between two people can never really be explained on a rational basis.' Joint decisions will have to be made by the two of them in the coming years because they want to be number 2 in their sector, which means an annual growth of 40-50%. Not more than that! Faced with this challenge, the perfect collaboration between the two of them can only be a great advantage.

5. Ethics and deontology

The academic world has a mission of education and research in a framework that is determined and partly paid for by society. The business world has a mission of commercial activities and growth with a significant social impact (i.e. employment and wealth creation). Although at a first glance these two missions are not necessarily on the same track, they do come directly into contact with each other when spin-offs are created. This contact usually creates a win-win situation, however at the same time a number of elements exist in this interface that should be paid attention to, which we will discuss here more in detail.

The mission of the knowledge centers can be found in their mission statement. This mission is not optional: it is a societal contract between a public institution and the community.

For strategic research centers (SRCs), the direct economic valorization of research results, from which the generation of patents and the creation of spin-offs are a logical part, is one of the reasons for their existence. The VIB, for example, refers in a clear way in its mission statement to the goals of technology transfer and the protection of inventions by patents.

At universities, at a first glance the cards are dealt in another way. Article 4 of the University Decree (a type of law of the Flemish government) stipulates that universities, in the interests of society, “are operating at the same time in the field of academic education, performing scientific research and providing scientific services”. However, since 1995 there has been another decree on scientific services that states that Flemish universities are obliged to establish an industrial interface, which takes up all contractual obligations with third parties (e.g. IWT and EU projects) and which also regulates the participation of universities in the spin-offs they create. The mission of economic valorization of the universities, which is an integral part of the scientific services, is as such also regulated by this decree.

Ostensibly, this interface of ‘free’ academic research and economic valorization is a possible source for problems. Thus, one can, for instance, ask the question as to whether or not a researcher may publish research results without compromising his/her credibility because he/she has a material interest in a company that has come into existence from related past applied research. Such a balancing act is only feasible within a well-thought out ethical and legal framework, which relies on a clearly formulated mission. More and more journals require that a researcher explicitly states possible conflicts of interests and clearly discloses them when publishing his/her article.

In a doctoral thesis (2010) at the Technical University Eindhoven, Elco van Burg (32) discusses how a stimulating policy can promote the creation of spin-offs in a university environment. He devotes an entire chapter to a detailed ethical evaluation of this process. In summary, he has identified in a founded way three advantages and three disadvantages.

The main advantages are (a) the use of knowledge, (b) the creation of economic growth, and (c) learning another culture. The main disadvantages are (a) the change in direction of the research, (b) the inhibition of open communication (the *anti-commons* effect), and (c) the threat to objectivity.

Directing research by interaction between academic and industrial initiatives is a dimension that transcends the creation of spin-offs. The *anti-commons* effect and the threat to objectivity pose a more immediate concern and therefore are discussed below more thoroughly.

Elco van Burg’s conclusion is that the creation of spin-offs in a university environment is a desired process and that the advantages are greater than the disadvantages under the condition that disadvantages be sufficiently mitigated. Research has shown that “designs” exist that can effectively reduce the disadvantages.

The *design* that van Burg identifies as the best to both promote fundamental research as well as to stimulate the creation of spin-offs, mainly from an ethical point of view, is **dual in structure**: research and education on the one side, development of a spin-off and coaching on the other side. Both objectives should be separated from the beginning in both the management context as well as the physical context.

Ethical and deontological dimensions are increasingly important in the entrepreneurial context. In education, the explicit and implicit aspects of doing business must be addressed, particularly with respect to corporate sustainability or social responsibility. From an ethical perspective, it is particularly important that every knowledge center develops a generic deontological code of ethics that explains, in a transparent way, what attitude or position all parties in the course of the establishment of the spin-off should adopt.

Obviously, the scientific enterprise process and commercial path in the begin phase of setting up a spin-off are still closely intertwined, and boundaries should be negotiated (33). In the long run, both activities should be “disentangled” so that each can go their own way and have a maximal chance to develop (34), (35), (36), and (37). A sufficient period of incubation can facilitate this disentanglement.

One can ask himself/herself if this dual structure described by van Burg is sufficiently present in the Flemish knowledge centers.

The universities have developed throughout the years a healthy *modus vivendi* to cope with this issue. This potential danger was, after all, one of the reasons the decree on scientific services in 1995 was written. As such, the universities were obliged by decree to set up a dual structure, namely the ‘industrial interfaces’ (i.e. a technology-transfer office), that are clearly positioned with respect to education and research.

Over the years, the SRCs have also built their own valorization model. Research into the so called ‘virtual’ SRCs (i.e. VIB and i-Minds) is performed by research groups who are embedded at the university with respect to valorization: The two SRCs mentioned above make five-year framework agreements and agreements with the universities regarding the right of initiative and follow-up of the spin-offs. Similarly, the other two SRCs (imec and VITO) have a detailed valorization strategy. In any case, all the SRCs have a management agreement with the Flemish government that includes clear passages on the creation of spin-offs.

Another issue is related to the inhibition of open communication, the so called *anti-commons* effect.

The commercial exploitation of knowledge arising from the university reduces the possibility of effective communication about this knowledge: the *anti-commons* effect (32). (38) argues that the social-contractual obligation of the university with respect to the community is to *create and sustain an 'intellectual commons': a knowledge archive accessible to all members of society*. Every force on the freedom of publication, even if we are speaking about a delay, can have an impact on the career development of the researchers and the chances they have to acquire projects for their research unit in a competitive world. In laboratories with connections to industry, researchers can be collectively held back in the efforts to build their resumes. It has been reported that open communication among students and staff is reduced when some of them are, early on, involved in entrepreneurship (39). This can make the education and research process more difficult.

In the context of spin-off creation, it is clear that this is a compromise. Society requires not only clear and open communication of scientific research results, but also high expectations are being made in the economic valorization of the same research results.

It is therefore essential that universities and SRCs install the necessary mechanisms to monitor this compromise. In this way, potential patenting of an invention can suspend the publication of research results for some time, but this term should be held 'reasonable' for all parties involved.

On the other hand, the creation of a spin-off requires sometimes a (temporary) protection of the confidentiality of the intellectual property that will be the nature of the know-how of the spin-off.

This protection is then a necessary price that must be paid for the creation of a spin-off, but to this respect the researchers and their institution are 'compensated' by means of shares in the new spin-off.

Perhaps, the old romantic image of 'academic knowledge' that is completely selfless, and therefore "free of obligation", should be revised. In relevant literature, this issue will have undoubtedly already been addressed: We simply live in a knowledge society, where all forms of knowledge are relevant with respect to society as well as economic relevance. The argument that a lot of research is funded by government at the SRCs and universities, and that the research is as such 'property' of the 'community', is a model that is no longer tenable. If one wants to stimulate institutes and researchers to valorize more (or exploit) their research, then it is absolutely necessary to build in the necessary '*incentives*' for the individuals concerned (e.g. the right to acquire shares in return for intellectual property) and for the institutes to provide the appropriate structures. In Flanders, we are already on the path to developing a set of techniques to deal with this issue.

The potential culture shock between university researchers, who have high expectations for their business plan, and the investors who step into the project should not be underestimated. This culture shock must be absorbed by **the professionalism of the incubation environment** – the *technology transfer offices*.

6. Conclusions

In Flanders, a long history of entrepreneurship has existed, that has led to a strong network of small and medium-sized enterprises, which act as a mainstay in our society. In the last years, however, fewer and fewer enterprises have been established such that there is an urgent need to reflect on our society and its fiscal climate. In this position paper, we reflect upon the phenomenon of spin-offs originating out of knowledge centers (where one observes an increase) and seek new accents for the support of entrepreneurship in Flanders.

There is, within the talent pools that have been created due to the increased financing of research at universities, an interesting potential for actively scouting talent for entrepreneurship to spin-offs. It has been shown that Belgium has a stronger tendency towards 'intrapreneurship' than other European countries. As it seems that spin-offs have a better chance of succeeding after a longer incubation period, a joint policy between universities, colleges and strategic research centers should be thought on in order to make this search for talent possible.

Fueling entrepreneurship is a task that must be taken seriously at all levels of education. Similarly, education should be experience-based (skill oriented) and delivered in collaboration with companies and associations (i.e. both business and alumni). In addition, the ethical dimensions of entrepreneurship should be offered such that corporate sustainability and social responsibility are highlighted.

In order to achieve this, politicians and policy makers will have to notch up their activities in order to create a climate that brings entrepreneurship positively into the spotlight, values it and promotes it. Additional measures/tools should be developed to create this climate in the short term and a simplification of administration is imperative. *Time is of the essence*, if we do not want to sink further in the international competitiveness and innovation rankings.

Word of Thanks

The contribution of Johan Cardoen (*VIB - Flanders Institute for Biotechnology*), Jos Peeters (*Capricorn Venture Partners*), Yves Fassin (*European Venture Capital Association*), Patrick Dhaese and Patrick Vankwikelberge (*Tech Transfer Ghent university*) is sincerely appreciated.

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Annex: overview of recent initiatives by knowledge centers in Flanders, in connection with spin-offs, and list of initiatives by the government

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