

# Leveraging on public means for start-ups: A case study on the catalytic role of iMinds' entrepreneurship program

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## Abstract

Attention for entrepreneurship and technology transfer programs at public research organisations (PROs) has increased over the last decades. However, given the relatively young history of increased attention for these activities, PROs are still searching for the best 'recipe' to achieve success. This study presents the case study of iMinds, a PRO focused on ICT in Flanders (Belgium), where the entrepreneurship program has been opened up to externals (in addition to its own researchers). By analysing the case study, the effects of opening up these programs on the participation degree, number of start-ups and spin-offs and subsequent effects on the entire ecosystem are analysed. The results show a leverage effect on the initial investments on the entire ecosystem and increased attention for entrepreneurial initiatives, both amongst researchers as well as externals.

## Keywords

Incubator; Entrepreneurship program; Public research organisation; Case study; Funding

## 1. Introduction

Public research organisations (such as universities, university colleges and strategic research centres funded with public means) have traditionally been perceived as institutions creating knowledge and disseminating it through education and (scientific) publications. Over time however, their position as 'ivory towers' has been criticised by various stakeholders (Bok, 1982; Etzkowitz et al., 2000; Mowery et al., 2004). Society has been asking for more direct and indirect return for society, since these institutions are using vast amounts of tax payers' money (Bok, 1982; Etzkowitz et al., 2000). Therefore, in more recent history these public research organisations (PROs) have been engaging more directly with society by transferring their knowledge through new mechanisms (e.g. contract research, licensing, spin-off ventures) (Rogers et al., 1999; Debackere, 2000; Klofsten and Jones-Evans, 2000; Agrawal, 2001; Lichtenthaler, 2005; Trott, 2008).

Traditionally, this new role has required more direct interactions between researchers on one hand and companies and other societal actors on the other. Most public research organisations have set up a specific group of people to deal with legal and contractual aspects of these relationships, which is usually named the technology transfer office (TTO), liaison offices or alike. The operationalization often differs: sometimes the TTO operates as a group of people in the research department, it is an autonomous group within the PRO, it is a separate legal entity as subsidiary of the PRO or it sometimes even is a separate legal entity shared with several PROs (Debackere and Veugelers, 2005; O'Shea et al., 2005). The role and responsibilities also strongly differ: contracts and relationships with external actors, stimulation of entrepreneurship, coaching and advising spin-off ventures ... (Birley, 2002; Debackere and Veugelers, 2005; De Cleyn, 2011).

This paper intends to investigate the role of the entrepreneurship program at iMinds, a public research organisation on ICT in Flanders (Belgium). The case study will elaborate on the role and objectives of the entrepreneurship program, its characteristics in engaging the entire ICT community and the effects generated for iMinds and other stakeholders involved. As is the case with most TTOs in PROs around the globe, the iMinds entrepreneurship program envisages supporting the commercialisation of iMinds technologies and knowledge, the transfer of knowledge towards business and societal partners and the stimulation of entrepreneurship amongst researchers and students. What distinguishes iMinds' entrepreneurship program from most approaches of other TTOs, is its openness for external participants. This case study seeks to explore the benefits (and drawbacks) of this openness and potential implications for other PROs seeking to maximise their societal engagement and impact in terms of entrepreneurial behaviour and outcomes.

The objective of this case study is to provide more insights into the catalytic role PROs can play in creating a fertile environment for entrepreneurship in general and the creation and development of new start-ups and spin-offs in particular. Based on the specific case study of iMinds, lessons will be drawn on the potential role of public means and a new way of organising technology transfer activities at PROs.

The remainder of this paper is structured as follows. The next section deals with prior literature on entrepreneurship programs at public research institutions and different ways of organising technology transfer activities in these settings. The main question raised in this section is what structures and activities are put in place in these 'classic' tech transfer activities and what makes them successful. The method sections deal with the main methodological aspects and concerns, since the authors are also part of iMinds. The fourth section then presents the actual case study of iMinds, a sector-specific public research organisation, which combines research and entrepreneurship programs. The results' section presents findings on both the success (or absence thereof) of the entrepreneurship and tech transfer activities as well as the factors contributing to these outcomes. In last instance, the implications on a more general level are discussed. A number of lessons could be learned for other public research organisations seeking to enhance their entrepreneurship programs.

## **2. Literature review**

Although academic entrepreneurship has been existing for centuries, it has only recently been put on a prominent spot in policy agendas and PROs' scope (Etzkowitz, 1998; Dale Meyer, 2011). PROs can play an important role in the dynamics of a region, given their ability to create knowledge, attract firms to settle in their environment and foster job creation via spin-off establishment (Jones-Evans et al., 1999). Additionally, PROs' inventions are an important source of knowledge spillovers (Di Gregorio and Shane, 2003). This section further explores the role of PROs and the antecedents and prerequisites of successful entrepreneurship and tech transfer activities.

### **2.1. PROs and the Triple Helix**

As touched upon earlier, public debate on the role of PROs has led to more direct interactions with societal and business stakeholders (Delanty, 2002; Arthur and Bohlin, 2005; Lerner, 2005). This engagement touches upon many related aspects. In this regard, the Triple Helix model describes the interactions between academia, business and governments (Etzkowitz, 1998;

Leydesdorff, 2000; Etzkowitz and Klofsten, 2005). Although academic entrepreneurship has been existing for centuries, it has only recently been put on a prominent spot in policy agendas and public research organisations' scope (Etzkowitz, 1998; Dale Meyer, 2011). PROs can play an important role in the dynamics of a region, given their ability to create knowledge, attract firms to settle in their environment and foster job creation via spin-off establishment (Jones-Evans et al., 1999). Additionally, PRO inventions are an important source of knowledge spillovers (Di Gregorio and Shane, 2003), potentially providing benefits for many stakeholders in a region.

Some of the most successful PROs, like Stanford University and MIT in the United States and University of Oxford and ETH Zürich in Europe, have established a variety of mechanisms to interact with society. These include e.g. attracting staff members from outside academia, industry-sponsored research programs, consultancy and training activities to stimulate knowledge dissemination etc. (Birley, 2002; De Cleyn, 2011). Additionally, they engage in and contribute to public policy debates and frequently interact with and advice governments, thereby closing the Triple Helix loop. Being embedded in an ecosystem with relevant stakeholders thus becomes key for PROs wishing to deploy successful technology transfer and entrepreneurship activities.

## **2.2. Technology transfer activities**

An important part of organising entrepreneurial programs at PROs and supporting new start-ups is related to TTOs. They can be a starting point to build up the initial market credibility and reputation for their start-ups (Mosey and Wright, 2007; Lee, 2009; Scillitoe and Chakrabarti, 2010), through their network with investors, potential customers, coaches, other start-ups and other support organisations (van Burg et al., 2008) and closing the gap between academic research and business environment (Mosey and Wright, 2007). The role of TTOs and incubators in organising networking events to stimulate academic researchers to become more involved in the process and as brokering event to bring several stakeholders together (surrogate entrepreneurs, investors and the inventors) can be of crucial help towards start-ups (Nicolaou and Birley, 2003). Yet, the effectiveness of TTO and/or incubator support depends on the frequency, time allocation and intensity of the interactions and the readiness of the start-up to accept the support (De Cleyn, 2011; Scillitoe and Chakrabarti, 2010).

Further studies investigating the determinants of successful technology transfer and entrepreneurship programs have identified additional factors. Debackere and Veugelers (2005) for instance have explored the role TTOs (can) play in improving links between PROs and industry. Their study showed three main (internal) factors fostering industry-science links (Debackere and Veugelers (2005):

- Finding an appropriate balance with regard to (de)centralization within the PRO;
- Applying a rewarding incentive structures for researchers and research groups at PROs;
- Implementing good decision and monitoring processes within the TTO.

Additional determinants of successful technology and knowledge transfer have been identified by e.g. Souder et al. (1990), Harmon et al. (1997), Cummings and Teng (2003) and Stojmanovski et al. (2013):

- Frequent interactions between the PROs and industry partners, in which TTOs can play a facilitating role;
- Common understanding between the providing and receiving party on where the desired knowledge resides;
- Promotion activities of PRO technology, facilitated by the PRO and its TTO;

- An articulation process through which the source's knowledge is made accessible to the recipient.

In summary, these studies mainly stress the importance of [1] setting up an internal structure supportive to frequent PRO-industry interactions and technology transfer activities and [2] creating frequent opportunities (events, meetings ...) where researchers and external actors can interact and create a common understanding.

### **2.3. Clusters of innovation**

PROs are operating increasingly in a globalised context, where the relationships and interactions with other actors outside their regions gain importance. Especially for those PROs seeking to maximise the impact created by their knowledge and technologies, building bridges to other regions around the world becomes imperative (Engel and del Palacio, 2009). In this regard, several scholars have referred to the concept of clusters of innovation or COI (Florida and Kenney, 1990; Porter, 1990; Engel and del Palacio, 2009; Engel and del Palacio, 2011). These refer to ecosystems of innovative players (large corporations, SMEs, start-ups, future entrepreneurs) and the supporting stakeholders (including incubators, financiers, service providers and alike) (Florida and Kenney, 1990; Saxenian, 1985, 1994, 2006; Scott, 1986; Scott and Angel, 1987; Scott and Paul, 1990).

PROs aiming at creating a lasting and positive impact on society should embrace the concept of clusters of innovation for several reasons. In first instance, PROs can learn from the best practices used in COIs around the globe. Many regions have e.g. tried to replicate the success of Silicon Valley, being recognised as one of the most successful COIs worldwide (Engel and del Palacio, 2011). Additionally, engaging with other COIs provides additional opportunities for PROs to source new talent and ideas (Engel and del Palacio, 2009). Thirdly, connections to other COIs create new opportunities for start-ups and spin-offs from one regions to engage in activities in the other regions (Engel and del Palacio, 2009; Engel and del Palacio, 2011).

### **2.4. PROs and the funding gap for start-ups and spin-offs**

A fourth important pillar of successful technology transfer and entrepreneurship programs at PROs refers to funding provided for start-ups. As most risk capital providers prefer to invest in ventures closer to their first market introduction, start-ups face difficulties to find pre-seed financing. Technology-based ventures encounter a higher risk to be confronted with this financing gap, as their time-to-market is often longer following the origin of their underlying idea (Sullivan and Miller, 1996; Zider, 1998; European Commission, 2001; Lerner, 2005). Therefore, PROs providing pre-seed funding for their start-ups may positively influence the (local) availability of funding and as such help in creating a more supportive environment for the creation of an entrepreneurial ecosystem around its premises.

While many researchers argue that availability of funding is important for a venture (e.g. Mishra, Kim et al., 1996; Davidsson and Klofsten, 2003; Hindle and Yencken, 2004), others argue that undercapitalisation increases a venture's survival chances, as they have to spend their resources very carefully (e.g. Klofsten et al., 1999; Riquelme and Watson, 2002; Bates, 2005). Overall, timely access to appropriate (and sufficient) financial resources has been recognised as critical success factor for the development of new start-ups (Gartner et al., 1998; Dahlqvist et al., 2000; Davidsson and Klofsten, 2003; Gregory et al., 2005). Yet, due to their limited track record, start-ups do not have access to the full range of financing options (Cassar, 2004). The

presence of a PRO and its entrepreneurship programs may have a leveraging effect on the availability of private funding for (other) start-ups in the region.

### 3. Methodology

This study takes a case study approach, whereby the entrepreneurship program of iMinds and its effects on the outcomes of the entrepreneurial processes are investigated. Since the authors are responsible for designing and running the entrepreneurship program at iMinds, they have access to all relevant data on the purpose, activities and effects. On the other hand, this may hamper their objectivity. The main data stem from the incubation program and its participants, which are entrepreneurs and newly founded start-ups. Data collected on these start-ups mainly include their origin (stemming from iMinds research, research of other public research organisations or coming from externally), the funding raised (including source, size and timing), employment generated (both on the payroll and in total, i.e. including self-employed management) and the interactions with other actors in iMinds' network.

Additionally, the effects of iMinds' entrepreneurship program are benchmarked against similar programs elsewhere in the world (mainly the U.S.), on which data are publicly available. The main benchmark is the TechStars program in the U.S., running entrepreneurship programs on different locations. Data collected on these programs focus mainly on the number of participants, the funding raised and the employment generated. All data have been obtained on the TechStars website and, especially on the funding raised, it contains information on the source of the funding and when it was obtained. Additional sources of benchmark material include the U.S. Y-Combinator program and the Canadian Lead To Win program.

These data mainly concern objective measures which do not require any / much interpretation. This should guarantee a maximal amount of objectivity in the results and their interpretation and counterbalance the objection that the authors also run these programs.

From the case study perspective, a staged approach has been adopted. In first instance, a literature review has been conducted on several topics (including the Triple Helix model, the creation of Cluster of Innovation, the role of tech transfer offices, the funding gap and the importance of funding (pre-seed and risk capital) for entrepreneurship programs).

The second stage focuses on collecting and analysing data on iMinds' entrepreneurship programs, and reflecting on the context in which these programs emerged and are operated. For this case study, following data have been collected:

- General description of the various parts of the entrepreneurship program;
- Number of participants in the various parts of the entrepreneurship program;
- Number of projects submitted to and supported in the incubation program;
- Origin of these incubation projects (PRO research, external sources ...);
- Pre-seed investments made by the PRO in the incubation projects;
- Follow-up investments received by the incubation projects during or after the incubation program;
- Number of jobs created by the supported start-ups and spin-offs;

The last part of the approach deals with extrapolating lessons learnt from the iMinds case study towards implications relevant for a broader audience (i.e. stakeholders such as policy makers, tech transfer offices and management of public research organisations). These implications have been validated by formal and informal discussions with peers (researchers on the topic, practitioners, entrepreneurs and policy makers).

#### 4. Case study organisation: iMinds

Due to two main evolutions in the last decades, being divestments by large international corporations and the need for an ecosystem generating enough high-growth young companies, the regional government in Flanders (Northern part of Belgium) decided in 2004 to found iMinds (originally called IBBT or Interdisciplinary Institute for Broadband Technology, even though from its inception it was not limited to broadband technology). The same regional government had taken similar initiatives to establish strategic research centres for other spearhead industries earlier, with the foundation of IMEC on micro-electronics in 1984, VITO on cleantech and environmental technologies in 1991, VIB on biotechnologies and nanotechnologies in 1996.

iMinds (as well as the other three similar strategic research centres) has been set up as single point-of-contact organisation designed to build bridges between university research and market and societal players (companies, governments, non-profit organisations). In this sense, it has been set up as linchpin and catalyst for a regional cluster of innovation (COI) (Engel and del Palacio, 2009). The goal of iMinds is to create an entire ecosystem in the ICT sector, with the mission to *create a lasting and positive impact on society through information technology*. This mission is realised through two core pillars: demand-driven research and entrepreneurship.

Similar to VIB, but unlike IMEC and VITO (whose activities are centred on a single campus), iMinds is conceptualised as a virtual organisation. Besides the small central staff, coordinating and supporting iMinds activities, the majority of the staff and collaborators are physically employed at different locations in Flanders. iMinds' research groups are located within the relevant ICT-related research group at the existing five Flemish universities and most researchers have the double affiliations (iMinds and the respective university). With these universities, strategic framework agreements have been closed to anchor the relationships.

From its inception onwards, the organisation has been targeting to link up with relevant international networks to support the global ambitions of the researchers and companies of the region, both acting as central actor in a local COI and also embedded in a global network of clusters of innovation (Engel and del Palacio, 2009).

##### 4.1. Structure and activities

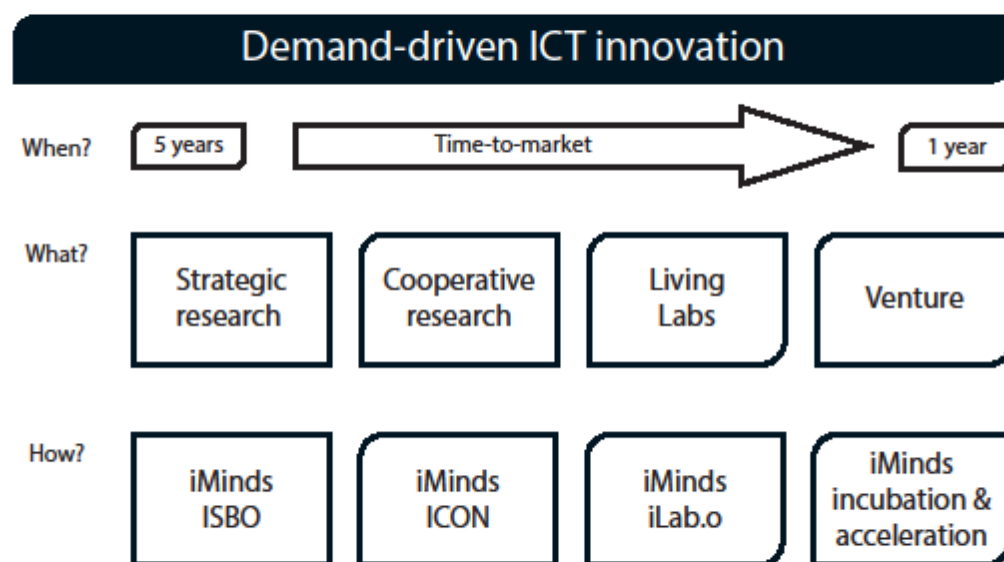
The structure and activities of iMinds are centred around its role as network organisation and linchpin in a regional COI. By initiating collaborative research projects between all actors in this cluster, being academic organisations, large corporations, SMEs, governments and non-profit organisations, the goal is to create, capture and disseminate new innovations and knowledge to create a positive and lasting impact on society. Additionally, the entrepreneurship programs provide training, coaching and (financial) support for (future) entrepreneurs. In this sense, iMinds tries to cover the entire value chain of innovation (as depicted in Figure 1).

One of the key aspects of iMinds' activities is its relevancy for business and society, i.e. the more demand-driven and application-oriented nature. Even though a layer of basic research activities are funded, the main focus is on activities and programs closer to the market or real-life applications: applied collaborative research, technology transfer, incubation and venturing. As depicted in Figure 1, iMinds also supports more strategic research activities through its ISBO program (ISBO or Interdisciplinary Strategic Basic Research). However, these projects typically have a longer time-to-market and are (potentially) less demand-driven by their nature (Goldenberg, Lehmann et al. 2001; Davidsson and Klofsten 2003; De Cleyn, 2011). On the research side of iMinds' activities, more emphasis is put on interdisciplinary and collaborative research projects (ICON), where academic research groups and private entities collaborate on an intensive project basis. In these ICON projects, academic research groups and private organisations collaborate in intensive projects, where each entity is being funded for its own

activities: the researchers by iMinds, the private entities by their own means and potentially subsidised by IWT, the Flemish public funding agency for innovation and technology. The typical outcome of these projects is at least a proof-of-concept or early prototype.

Once these research outcomes are translated into more market-oriented applications, demonstrators and prototypes, living labs settings can be provided to further test the applications, both from a technical perspective as well as from user perspective. These living lab activities are clustered in the iLab.o (for user testing) and iLab.t (for technical testing) groups. Besides deploying regional living lab activities, iMinds also tries to link their activities to other COIs elsewhere on this kind of activities. In this sense, iMinds hosts the secretary for the European Network of Living Labs (ENoLL), an association grouping over 300 living lab networks all over Europe.

**Figure 1 Structure of iMinds' activities**



Closest to application of new technologies in business and society are however, as can be seen in Figure 1, the incubation and acceleration activities (e.g. new spin-off projects, (pre-)seed financing, internationalisation of start-ups and SMEs or the development of entrepreneurial skills of researchers). These include the 'classic' technology transfer activities, as found in most PROs these days, as well as entrepreneurship programs for externals who can reinforce or build upon the iMinds research outcomes. These entrepreneurship programs will further be elaborated upon in section 3.3.

With an annual budget of 40 million EUR, a high amount in a relatively small region, iMinds aims to be a catalyst for innovation and to create large multiplier effects. Management was brought in from the private sector to lead the organisation and a governance structure was implemented that included representatives from both the public and the private sector. These board members represent iMinds' main stakeholders: government, universities, large companies in the ICT landscape, financiers and (to lesser extent) entrepreneurs.

iMinds has been created as a strategic research organisation by the regional government in Flanders, being an independent, non-profit organisation. In a sense, iMinds is a 'virtual' organisation, coordinated by a relatively small central staff (about 40 people) responsible for

strategy, incubation and venturing activities and operations' support. In total, iMinds has about 150 people directly on its payroll, and funds another 800 on the payroll of the various universities in Flanders.

## **4.2. Funding research**

The main pillar of iMinds' activities remains conducting demand-driven and interdisciplinary research to develop new ICT-technologies, applications and innovations. To achieve this, the majority of iMinds' yearly budget (i.e. 25 out of 40 million EUR) is spent on multi-disciplinary university research at all five Flemish universities. As linking pin in a COI, iMinds believes this approach leads to the generation of new technologies, products and services, which can be brought to the market and society either through existing market players (e.g. participating in project consortia for the ICON projects) or through the creation of new spin-off and start-up ventures. The latter could/should be 'born global' players, which through the links with other COIs worldwide further disseminate these new technologies.

The research activities are centred around the existing (ICT-related) research groups within the five universities in Flanders (Free University of Brussels, Ghent University, Hasselt University, KU Leuven and University of Antwerp). Tapping into this existing pool of people and competences creates spillover effects from the universities to iMinds in first instance, and further downstream towards project partners in second order. However, this structure of researchers being embedded in a virtual organisation as iMinds also ensures knowledge spillovers between the different university research groups amongst one another on one hand and from external project partners towards the researchers on the other.

The latter effect is mainly generated through the demand-driven, cooperative research occurring through the ICON projects. The starting point of an ICON project is an ICT-related need detected by companies, governments or organisations and is typically situated in one of iMinds' core application domains: Media, Health & Care, Energy, Smart Cities, Manufacturing and ICT. Research partners in ICON projects originate from various sources: large (international) corporations, SMEs, governments, cities and communities and social profit organisations. Throughout iMinds' short history, over 1,000 partners have participated in various projects, including for instance Agfa-Gevaert, Alcatel-Lucent, Barco, NXP Semiconductors, VRT (public Flemish broadcaster), Telenet, Cisco, Small Town Heroes, Ghent University Hospital, Cultuurnet, Videohouse or VDAB.

The funding model of these ICON projects is unique and provides a major leverage for direct (and indirect) valorisation of research outcomes in the marketplace or through more societal-impact driven application. In such an ICON project, a consortium consists of iMinds research groups (one or more) and private partners (of all kinds). In terms of (financial) efforts, projects typically require at least 50% of the efforts to be borne by the private partners. Each partner finances its own research efforts (implying that iMinds itself fund about 50% of the total project cost, being the efforts of its own research groups). Additionally, the private partners can turn to IWT (the public Flemish agency for Innovation by Science and Technology), a public organisation providing subsidies for the development and application of new technologies and innovations. These private partners can get between 40 and 60% of their costs funded by IWT, using the same application (process) as for the overall ICON project. In the end, this potentially creates a 3x leverage on the means invested by private partners in ICON projects (for every euro they invest, another euro can be provided by IWT and two additional euros by iMinds through its research departments). This leverage is an important driver for conducting demand-driven ICT research in Flanders and potentially leads to more and faster adoption of new technologies by private (and public) actors.



The current research model applied by iMinds generates two potential streams of new ideas for applications in entrepreneurial (or intrapreneurial) projects. On one hand, the research groups have their own research projects, based on ISBO funding or additional grants, subsidies and funds they attract. This is no different from what happens in other PROs worldwide. Often, these ideas are rather technology-driven (De Coster and Butler 2005; Lerner 2005) and tend to be somewhat premature when moving towards the market through e.g. spin-off ventures (De Cleyn, 2011). The second stream consists of more demand-driven project outcomes emerging in ICON projects. Since these projects already involve market players and have more market-driven purposes, they typically have a shorter time-to-market.

### **4.3. Supporting technology transfer and incubation**

Besides supporting and coordinating demand-driven research in ICT, the second pillar of iMinds' core activities consists of the stimulation and support of technology transfer and entrepreneurship activities. Yearly, a budget of over 4 million EUR is being spent on these activities. Two key visions underpin this entrepreneurship program. First, these programs and activities do not necessarily envisage turning every research into an entrepreneur. However, the key underlying vision is that fostering human capital development in the area of entrepreneurship is beneficial to the system as a whole. Even for those not becoming entrepreneurs themselves, it makes sense to get notions on key concepts, since it allows them to either increase the applicability of their research and/or to behave in a more entrepreneurial manner in their respective organisations (whether these be PROs or companies). Second, the entrepreneurship programs are designed not only to serve the iMinds' research community (technology transfer and spin-off activities). In contrast with most entrepreneurship programs at PROs, which are closed programs to serve the valorisation of proprietary research results, iMinds' entrepreneurship programs are open to all actors in the ICT ecosystem and they are designed to foster spillover effects in all directions between all relevant actors.

The latter is illustrated explicitly for example in the incubation program iStart, where (starting) entrepreneurs are supported financially (pre-seed funding) as well as content-wise (training, coaching ...) with the end goal to evaluate the feasibility of setting up a new business. In this program, roughly 1/3 consists of projects emerging directly from iMinds' research, 1/3 stems from external ideas and the last 1/3 originates from externally, but was brought together to cooperate closely with iMinds research groups (usually being reinforced at a technological level).

Generally speaking, the entrepreneurship programs at iMinds consist of three pillars:

- *Human capital development* through entrepreneurship education and trainings programs for researchers, students and externals. This pillar contains a mix of occasional events and lectures on specific topics, workshops for students to stimulate their appetite for an entrepreneurial career, opportunity recognition workshops for researcher to discover application areas and (business) opportunities to valorise their research outcomes and intensive bootcamps (iBoot) to assess the feasibility of building a business case around a technological innovation.
- *Incubation support*: The second part of the entrepreneurship program provides pre-seed funding, access to funding through network partners, coaching and advice and other facilities (co-working space and incubator space) to support the creation of spin-off and start-up ventures. These aspects focus on people that have chosen to go the entrepreneurial path and are intensively supported during the iStart incubation program.

- *Internationalisation support* through connections to other COIs worldwide, to foster the international expansion of start-ups and SMEs. Especially in the ICT sector, markets are almost by definition global. This part of the program (Go Global) fosters the acceleration of existing businesses and the scaling towards becoming a global (niche) player.

The main unique characteristic of this entrepreneurship program is not the individual components. These are similar to many entrepreneurship and tech transfer programs found at various PROs around the globe. Its uniqueness rather lies in its open character. Acting as a lynchpin in a regional COI, this openness potentially generates spillover effects in both directions: researchers benefit from more regular interactions with companies and non-profit organisations, who could act as first (test) users, early customers or (commercialisation) partners; companies and entrepreneurs benefit from access to a large installed technological and research base, which could potentially strengthen their market position and enhance the sustainability of their competitive positions.

## 5. Case study results

The approach adopted by most TTOs of PROs is to support the commercialisation and societal impact of the knowledge developed in their institutions. The same approach was originally the focus of iMinds' entrepreneurship programs, with limited impact initially.

A shift towards becoming a networking actor however strengthened these programs, created an important amount of spillover effects towards other actors and reinforced the (open) cooperation mode with various stakeholders, as described initially by the Triple Helix model. This shift has been initiated in the summer of 2011, when the entrepreneurship programs have been made available to any relevant stakeholder in the ICT ecosystem in Flanders (and Brussels). After two years of operations in the revised programs, the first effects start appearing. They become apparent at three levels:

- Degree of participation of researchers and externals in iMinds' entrepreneurship program and number of people and projects supported;
- Collaboration and spillover effects between various stakeholders;
- Attractiveness for investors and leverage effect of the pre-seed funding provided by iMinds for new start-ups and spin-offs.

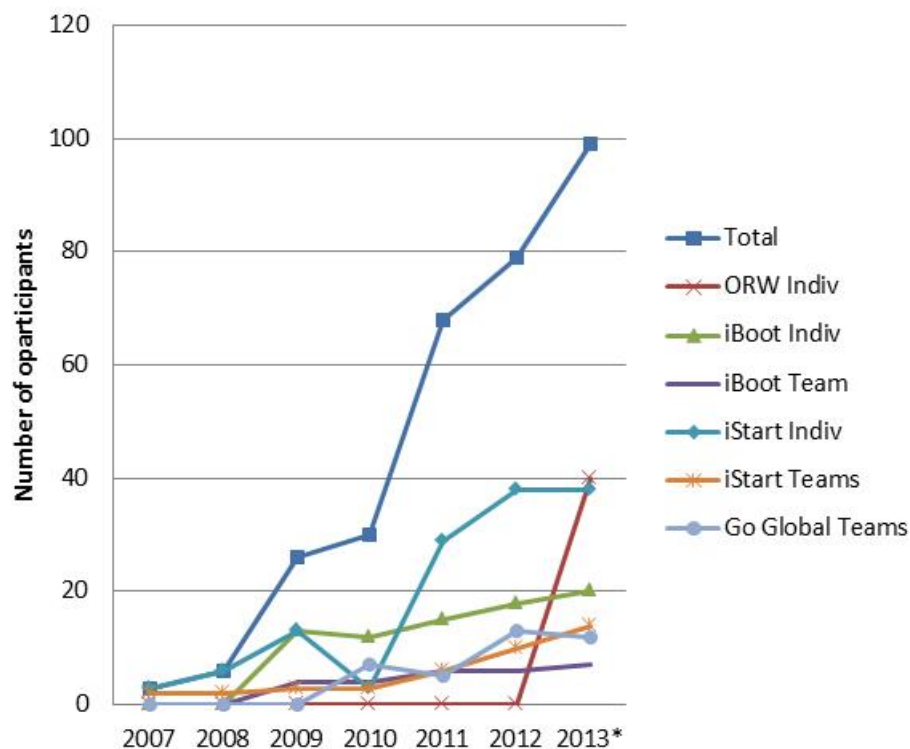
### 5.1. Number of participants and projects

A first measureable outcome of the entrepreneurship programs at iMinds is the number of participants (both individuals as well as teams/projects). Prior to opening up the program for external participants (i.e. non-iMinds researchers), the amount of participants was rather limited. This is not unusual. The organisation as such was young and had to build up everything from ground up and additionally a culture of technology transfer activities and entrepreneurial initiatives had to be installed amongst the researchers. Prior studies have shown this process does not happen overnight (Birley, 2002, Debackere and Veugelers, 2005). As Figure 1 shows, the entrepreneurship programs managed to attract an (slowly) increasing number of researchers in the period 2007-2010. At that time, the only program in which externals joined researchers was the iBoot bootcamp, in which (complementary) team formation was the first step towards building a business case on a research-driven idea.

Opening up the program to externals however drastically changed the impact of the entrepreneurship programs and their attraction for people to join. Figure 1 clearly demonstrates

a sharp increase in number of participants (total individuals) joining the program in the period 2011-2013. The numbers for 2013 are obviously provisional and will certainly even further increase. In the iStart incubation program for example, 6 new spin-off and start-up projects have been supported in 2011, 10 in 2012 and probably 20 will be supported in 2013 (provisional figure is 14, with one call for projects still open currently). These amounts obviously still pale before the number of start-ups supported by international programs such as Y-Combinator, who have supported over 500 start-ups since 2005. Yet, given the young age of the incubation program at iMinds, the first results are encouraging.

**Figure 1 Number of participants to iMinds entrepreneurship programs**



## 5.2. Collaboration and spillover effects

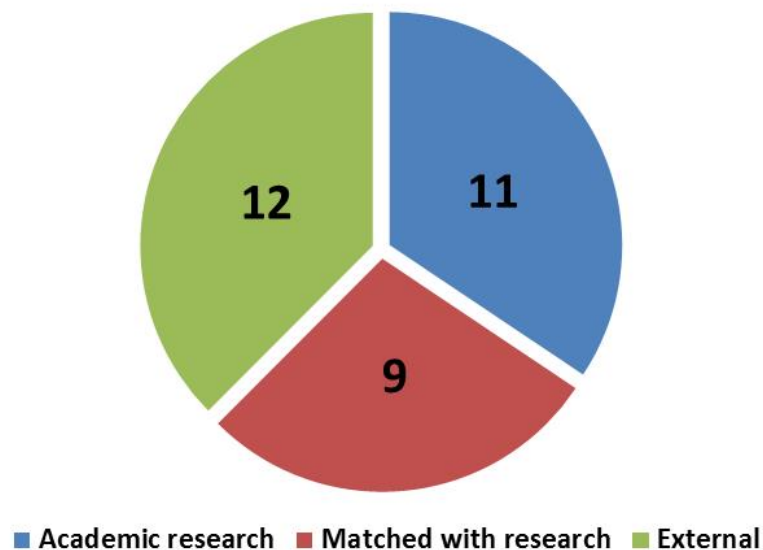
As discussed earlier, an important challenge for many technology transfer and entrepreneurship programs at PROs is creating sufficient opportunities for researchers to interact with external stakeholders (companies, governments, non-profit organisation and other societal actors) (Souder et al., 1990; Harmon et al., 1997; Cummings and Teng, 2003). This has been demonstrated to positively impact the success of technology transfer activities (Souder et al., 1990; Harmon et al., 1997; Cummings and Teng, 2003).

In the iStart incubation program, where (future) entrepreneurs prepare the real launch of their business, an interesting phenomenon starts to appear. Initially (until mid-2011), as with most of the programs, this initiative was limited to iMinds researchers preparing a spin-off venture based on their research results. However, since the program was opened to any entrepreneur willing to start his ICT-based start-up in Flanders or Brussels, two change start appearing: the first being the increase in number of projects and participants being supported in the program (as

discussed earlier and visualised in Figure 1), the second being much stronger and frequent interactions and collaborations between externals and researchers.

As Figure 2 depicts, entrepreneurs that originally had been independent of iMinds research started engaging more frequently in collaborative efforts with iMinds' researchers. Since opening up the incubation program mid-2011, 1/3 of the newly supported start-ups projects found its origin directly in iMinds research groups, 1/3 had its origin externally but started engaging with iMinds researchers and 1/3 remained external projects.

**Figure 2 Interactions between researchers and external entrepreneurs in the incubation program (iStart)**



The more frequent interactions create a number of interesting consequences. Firstly, spillover effects between the research community and (external) entrepreneurs start emerging. Entrepreneurs start gaining interest in what happens in terms of research projects and evaluate if there are opportunities for them to get access to technology that could reinforce their products and technological base. These spillover effects also appear in the opposite direction. Researchers are increasingly aware of market opportunities, either through own spin-off initiatives or through licensing their technologies to external entities (SMEs or newly found start-ups). Secondly, mixed teams are formed to work on a joint spin-off initiative. Prior research has clearly demonstrated that heterogeneous teams have more likelihood to build successful start-ups than homogeneous teams do (see e.g. Shane and Stuart, 2002; Aspelund et al., 2005, Mosey and Wright, 2007; Knockaert et al., 2011; De Cleyn, 2011; De Cleyn and Braet, 2012).

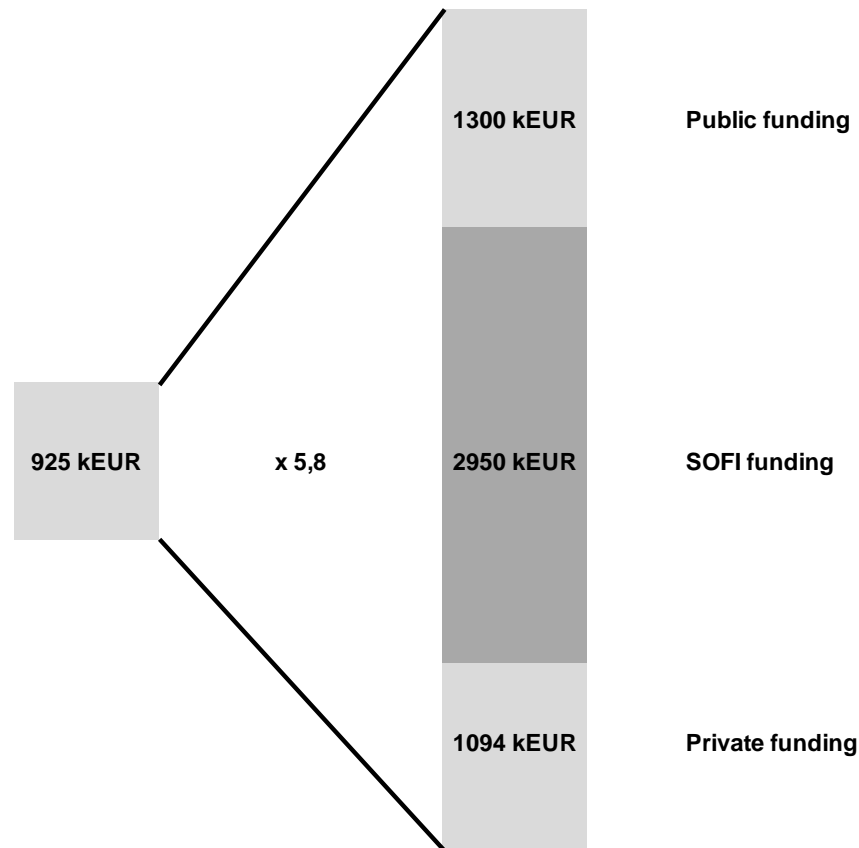
### **5.3. Attractiveness for investors**

High-tech start-ups and spin-offs from PROs have been demonstrated to be highly susceptible to the equity gap or lack of financial resources, which according to the majority of the studies undermines their long-term survival chances (see e.g. Mishra et al., 1996; Chiesa and Piccaluga, 2000; Manigart et al., 2002; Davidsson and Klofsten, 2003; Hindle and Yencken

2004; Erikson and Sørheim, 2005). In case of PROs, early access to financial resources from the parent organisation has been demonstrated to help in overcoming the equity gap, which is especially large for technology-based start-ups (Norrman et al., 2007) and serves as steppingstone for investments by third parties (Heydebreck et al., 2000; Brooksbank and Thomas, 2001).

In this sense, the incubation program at iMinds may be an important first step for ICT-based start-ups, since besides coaching and mentoring, the program provides (a limited amount of) pre-seed funding as first step in the funding process. However, as most technology-based start-ups are also quite capital intensive (Cassar, 2004), attracting follow-up funding is crucial for the development of these start-ups and spin-offs. Figure 3 gives an overview of the follow-up funding (equity investments or convertible debt) attracted by the incubation projects started in 2012. For the majority of these projects, this means they've only been supported for 1-1.5 years at the time of data collection. Even though the time-to-market for ICT start-ups is often shorter than in most other industries (Braet and Verhaert, 2007), this variable should further be measured on a longer term to get a view on more structural effects. In the relatively short time period between 2012 and now, the start-ups and spin-offs managed to attract about 5.8 times the pre-seed investments received by iMinds in the iStart incubation program. These resources have been attracted from different sources, including some public VC funds (though independent from iMinds), the SOFI fund (an investment fund created by Flemish government to support spin-off companies from iMinds and three other strategic research centres in Flanders) and private funding (business angels and private VC funds).

**Figure 3 Follow-up funding attracted by 2012 incubation projects**



What these figures basically demonstrate, is the leverage effect that can be created on small initial amounts of pre-seed funding. In about 1-1.5 years, this leverage effect of 5.8 times is an important step in closing the equity gap for high-tech start-ups in the region. A critical note however should be that the leverage on these public (pre-seed) means to attract private funding remains rather limited in first instance (leverage factor of about 1.2). However, the amounts of private funding should further increase in more advanced stages of the start-ups and spin-offs, given the fact that the equity gap has been shown to exist specifically for pre-seed and seed stages (Mason and Harrison, 1992; Murray, 1994).

#### **5.4. Side-effects**

Opening up technology transfer and entrepreneurship programs at a PRO is not mainstream and adds a number of additional challenges to running these programs. One of the main challenges is the initial investment in terms of people and resources to put programs in place. However, besides some of the initial effects described above in terms of participation degree and attractiveness of a PRO and its spin-offs for investors, the potential returns for the PRO are manifold:

- Even though hard(er) to measure, opening up and intensifying the programs strongly support human and social capital development of researchers, students and entrepreneurs.
- An ecosystem around the PRO start to emerge. This ecosystem includes amongst others R&D departments of other organisations, entrepreneurs, investors, service providers (e.g. accountants, consultants, coaches ...) and other network organisations. These entities all add new insights and ideas, which again stimulate further entrepreneurial initiatives and mind-sets.
- A financial return for the PRO on two levels:
  - Directly through additional license agreements on their knowledge and intellectual property rights and equity participations in the spin-offs and start-ups,
  - Indirectly through an increasing amount of joint research projects and contract research for external partners.
- In line with the view of Bailetti and Bot (2013), entrepreneurship programs can serve many functions, of which job creation is one of the most important. iMinds' start-ups and spin-offs have in the meanwhile created over 150 jobs.

The exact effects are however hard to measure. Anyhow, it is important for a PRO to look beyond traditional measurements of direct (financial) return, given the positive side-effects created both for the PRO as well as for the ecosystem and region in which it is embedded. Similar to the Canadian Lead To Win program, iMinds' entrepreneurship program is a 'spider in the web' that connects various actors and stakeholders supporting entrepreneurs and potentially creates benefits for its entire ecosystem.

## 6. Discussion and implications

PROs increasingly engage in technology transfer and entrepreneurship activities, in order to create added value for society based on new knowledge and technologies developed by their researchers. Even though academic entrepreneurship has existed for decades (Shane, 2004; Powers and McDougall, 2005), most universities and other PROs have only engaged in stimulating and supporting the direct commercialisation of their intellectual property over the last decades. In most countries, this shift from the two traditional core missions (research and education) towards three (including fostering the valorisation of research) has only been initiated over the last 20 to 30 years (Shane, 2004; Powers and McDougall, 2005; De Cleyn, 2011).

This relatively young tradition in fostering technology transfer and entrepreneurship at PROs entails a scattered landscape where PROs are still trying to identify the best practices to achieve the most effective and efficient outcomes. Academic research on these topics is still in its infancy (Djokovic and Souitaris, 2008), even though progress is made at rapid pace and best practices find their way into common practice rapidly. The case study of iMinds adds to this stream of knowledge by assessing the effects opening up a PROs technology transfer and entrepreneurship programs for externals (i.e. other people than the PROs own researchers).

Prior studies, such as one conducted by Cummings and Teng (2003), have pointed to various determinants of successful PRO technology transfer activities. Some of the main drivers are a shared understanding of where knowledge to solve problems resides and frequent interactions between the various actors (Cummings and Teng, 2003). An open approach to entrepreneurship and technology transfer program such as in the case study pave the way for these frequent interactions between external actors and the PRO's research community.

Even though this study has pointed to numerous positive effects of opening up technology transfer and entrepreneurship programs at PROs, a number of additional challenges come to the foreground. A first and important challenge relates to the initial investments on behalf of the PRO to (re)design programs that embrace externals to become part of their operations. Technology transfer and entrepreneurship programs are typically designed to support researchers in their valorisation efforts and to maximise a PRO's impact on society. However, these programs need adaptations to account for specific characteristics of programs with externals (including, but not limited to, program content and 'language', secrecy and non-disclosure, new models of sharing equity and benefits etc.). These investments are typically related to staffing, redesign of the programs and marketing thereof. Additionally, if successful, the more open approach also triggers a larger number of participants and thus increasing cost of running the operations (even though costs typically do not increase linearly).

A second challenge relates to safeguarding the interest of all stakeholders in the process. In the case of iMinds, this exercise is even more challenging given the virtual nature of the organisation (i.e. the partnerships with the five different universities). For all stakeholders, a win-win situation has to be aspired for: the PRO itself, its government, its researchers and in the new constellation also the entrepreneurs and external partners it closely cooperates with.

A third important challenge relates to the PROs own researchers. When opening up the program for externals, a risk emerges that the programs become more targeted towards and favourable for externals than for the PROs own researchers. This balance needs continuous monitoring, in order to ensure sufficient attention towards the valorisation of the PROs own intellectual property.

The case study on iMinds as PRO in Flanders (Belgium) and the use of public means to support the creation of an entrepreneurial cluster on ICT has several implications for various stakeholders. The main implication relates to policy makers: through an initial investment in entrepreneurship programs at PROs, a leverage effect can be generated at many levels: engagement of start-ups and SMEs in research activities, funding unlocked and attracted by technology-based start-ups, knowledge spillovers in all directions between academia and business, etc. This can only be achieved if these programs are open to all stakeholders in the community, and preferably focused on a specific sector (such as ICT in the case of iMinds). The latter secures a maximal amount of sector-specific knowledge and expertise being at the disposal of researchers and (future) entrepreneurs.

Secondly, this case study has implication for TTOs of PROs. The case study clearly demonstrates that opening up the support towards external willing to engage in the community of the PROs could pay off in many regards. Even though opening up entrepreneurship programs creates important challenges, spillover effects (in many regards) potentially generate important added value for the PRO. Furthermore, the increased interaction with externals creates more sector-specific knowledge on behalf of the TTOs.

At the level of start-ups, support from PROs and their entrepreneurship programs also create substantial benefits. Not only does the cooperation potentially strengthen their technology base (through the more frequent interaction between start-ups and researchers), the case study also shows that the initial (pre-)seed investments made by PROs in the start-ups may create a leverage towards unlocking and attracting a multiple in funding from other sources. As such, these dynamics could help in overcoming the traditional funding gap (identified by several scholarly studies).

Overall, the most important implication of this case study is the potential leverage effect of an initial investment in PRO and the catalytic effect of their entrepreneurship programs on the research community, the PRO itself and its surrounding stakeholders (including first and foremost the (future) entrepreneurs).



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