A Structured Approach to Academic Technology Transfer: Lessons Learned from imec's 101 Programme

Dimitri Schuurman, Stan De Vocht, Sven De Cleyn, and Aron-Levi Herregodts

> *We now accept the fact that learning is a lifelong process of keeping abreast of change. And the most pressing task is to teach people how to learn.*
>
> Peter Drucker (1909–2005)
> Management consultant, author, and educator

In this article, we describe imec's 101 Programme for academic technology transfer and explain how it supports researchers by following a structured process in a limited amount of time and by carefully involving different stakeholders and people with relevant skills and expertise. The programme combines insights in terms of processes and of team composition from the entrepreneurship literature and puts them into practice in an internal incubation programme that is generated from the bottom-up. Based on hands-on experiences and interviews with key stakeholders in the process, we evaluate the programme and distill lessons learned. The article highlights the importance of a structured technology transfer process in the early stages of opportunity discovery and entrepreneurial action, and it offers insights on team formation for academic spin-offs.

Introduction

Opportunity discovery and entrepreneurial action are regarded as the core elements of entrepreneurship (McMullen & Shepherd, 2006). Research has shown that the nature of these two core elements depends on the entrepreneurial type. Regarding entrepreneurial action, Shah and Tripsas (2007) distinguish between user entrepreneurship and opportunity entrepreneurship. Whereas the "user entrepreneur" is driven by their own experienced needs and their initial experimentation with and adaptation of possible solutions, the "opportunity entrepreneur" starts from an entrepreneurial decision based on the spotting of an external opportunity and engages in experimentation and adaptation afterwards. Within this article, we focus on a third entrepreneurial type: academic researchers that engage in the process of technology transfer. Perez and Sanchez (2003) define technology transfer as the application of information into use, involving a source of technology that possesses specialized technical skills, and the transmission to receptors who do not possess them and who cannot or do not want to create the technology themselves.

A specific case of technology transfer is the academic spin-off. These spin-offs exploit technological inventions resulting from academic research that are otherwise likely to remain unexploited (Shane, 2004). The number and successes of these spin-offs vary between different universities and research institutes, as shown for example by a pan-European study by De Cleyn and colleagues (2008). Di Gregorio and Shane (2003) identified two factors that increase new firm formation activity: i) the intellectual eminence of the university (or other research institute) and ii) policies of making equity investments in startups and maintaining a low inventor share of royalties. We observe that the more "eminent" universities and research institutes dedicate a lot of effort to technology transfer offices (TTOs) and entrepreneurship programmes. Famous examples are Germany's Fraunhofer technology transfer activities (Rombach, 2000) and the MIT in the United States with Bill Aulet's "New Enterprises" course and its derivation, "Disciplined Entrepreneurship" (2013), which promote a rigid 24-step process to successful entrepreneurship. These institutions infuse entrepreneurship into most aspects of university activities and try to create an en-

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trepreneurial climate with a structured approach towards technology transfer and academic spin-offs.

Human capital also has a large impact on the outcomes of the technology transfer process. Research indicates that academic spin-offs face more difficulties in the beginning than company spin-outs. Business parent organizations are better able than universities to provide spin-off companies with assistance and benefits, such as different kinds of knowledge and physical assets (Smilor, 1987). De Cleyn and colleagues (2015) argued that, for academic spin-offs, the absence of a proven track record in the market increases the importance of the human capital of the organization. They discovered that team heterogeneity is crucial for the chances of success, particularly in high-tech environments. Likewise, they found that experienced entrepreneurs also improve the team, but their study does not support the "serial entrepreneur effect" (unlike other studies, such as Shane, 2004; Barney et al., 2001).

Besides the team itself, the communication between different participating actors is seen as crucial, because the efficiency of the technology transfer process depends on the efficacy of the information processes between various actors and stakeholders (Rothwell & Robertson, 1973). Moreover, the capability to build alliances with relevant stakeholders can significantly reduce barriers to successful transfer (Lambricht & Teich, 1976).

Based on these observations, an approach to technology transfer was developed within the Flemish technology research institute imec (imec-int.com), taking into account these aspects related to academic spin-offs and other forms of academic technology transfer such as licensing. Within the 101 programme, as the approach is labelled, the focus lies on a rigid and structured process with clear deadlines and milestones, with special attention to project-specific team composition for the duration of the programme and beyond.

This article seeks to contribute to our knowledge and understanding of the technology transfer process in academic institutions. More specifically, it aims to build further knowledge on the importance of a structured technology transfer process in the early stages of opportunity discovery and entrepreneurial action. And, it seeks to focus attention needed for team formation in cases where the academic spin-off might be the primary, but not single, outcome of the technology transfer process. It also illustrates that establishing a structured approach to technology transfer within an organization can be a bottom-up effort, starting from smaller experiments to allow the programme to fit within the existing organization.

In the remainder of this article, we first report on the status of Flanders as a region for technology transfer and innovation. Subsequently, we look into some "best practices" related to technology transfer in the context of universities and research institutes. We then describe the 101 process as it was implemented in imec during the period from 2015 until now. We conclude with findings and discussion based on the first batch of projects that have followed the 101 programme.

State of the Art: Technology Transfer in Flanders

Scientific and technical research, development, and innovation are key factors for economic growth and improved competitiveness. Also, innovation, understood as the productive application of this scientific development and technology, is therefore an important engine for regional development if the goal is improved productivity and a change in the production model, thus occupying a preferential place among the principles of the Europe 2020 Strategy (European Union, 2015). The following statistics from 2014 summarize Flanders in terms of science, technology, and innovation (STI) (Flemish Government, 2016):

- Total annual budget: €1.88 billion (of which, €1.23 billion is strictly for R&D)
- Total Flemish horizontal budget (across all policy domains) for the science policy: €2.19 billion (of which €1.31 billion is strictly for R&D)
- Total Federal STI budget for Flanders: €300 million
- Total European STI budget for Flanders: €183 million
- €5,738 million on R&D (GERD – Gross Expenditures on R&D), of which 2/3 paid by companies and 1/3 by public research institutes
- The R&D intensity of Flanders was 2.46% (measured as the percentage of GERD related to GDP)

Based on the average innovation performance, the European Union (EU) Member States fall into four different performance groups, as classified by the Innovation Union scoreboard (European Commission, 2017): i) "innovation leaders" with innovation performance well above that of the EU average; ii) "innovation followers" with innovation performance above or close to that of the EU average; iii) "moderate innovators" with performance below that of the EU average; and iv) "modest innovators" with innovation performance well below that of the EU average. In the latest Regional Innovation Scoreboard (Hollanders et al., 2014), Flanders ranks among the innovation followers; consequently, its ambition to be among the top innovative regions in Europe requires further effort.

These numbers might seem rather impressive, but in Europe, Flanders is still labelled as an innovation follower (Flemish Government, 2016). Therefore, the new Flemish Government has confirmed in its governing agreement for the period 2014–2019 a focus on a growth path for the 3% target of R&D intensity, including the aim to achieve 1% R&D public outlays/GDP by 2020. To reach this goal, the government continues to stimulate various stakeholders from government, civil society, business organizations, and STI actors in Flanders to join forces to develop initiatives, set policy targets, or maintain important efforts for the long term in the field of R&D and innovation. Important actors in this ecosystem are the technology transfer offices (TTO). Each Flemish university has its own TTO, with each having a different number of spin-offs in its portfolio: TTO VUB (vubtechtransfer.be; 20 active spin off companies), TTO Ghent University (www.ugent.be/techtransfer/en; 32 active spin off companies and 9 pilot factories), TTO Leuven (lrd.kuleuven.be/en; 92 active spin off companies), and TTO Hasselt (www.uhasselt.be/techtransfer; 10 active spin off companies). Besides these university-related TTOs, Flanders also has four strategic research institutes – imec, VITO, VIB, and Flanders Make – that have fostered 33 spin-offs the past three years (Flemish Government, 2017). There is also a general technology transfer office, TTO Flanders, but this organization is merely dealing with information sharing and can be regarded more as a sector organization. The absence of a strong overarching organization has also fostered a climate of competition between the TTOs in Flanders. Moreover, the university TTOs focus mostly on specific services such as patenting, legal advice, help in starting-up a company, etc. Rarely do these organizations focus on the entrepreneurial process. Within this article, we describe the imec 101 programme as a way to overcome this gap by having a specific team composition and a structured process limited in time with clear deliverables.

The imec Approach to Technology Transfer

imec is the world-leading R&D and innovation hub in nano-electronics (since 1984) and digital technologies from Flanders and is a trusted partner for companies, startups, and academia. Since 2016, the new imec research institute is the result of the merger between the "old" imec strategic research centre and iMinds (Flanders' digital research and entrepreneurship hub). iMinds was a research institute founded by the Government of Flanders in 2004 focusing on applications of ICT and broadband technology. It was composed of 21 top-of-class research groups, divided over five research departments, and involved the entire Flemish media and ICT business community, with more than 1,000 researchers from the five largest Flemish universities (Ghent, Leuven, Brussels, Hasselt, and Antwerp) and a central staff of more than 100 people. With the merger, iMinds has become imec.Ghent, one of three business units of the new imec organization.

The problems imec faces during its continuous effort of bringing its technology to the market are similar to most research centres and universities around the globe: limited resources (time/money), different stakeholders, conflicts of interest, unclear decision criteria, involvement of different teams, and researchers that lack experience in business, among other challenges.

In the period from 2013 to 2015, before the merger, iMinds' technology transfer activities for researchers with promising technologies within the research institute were carried out by a single person. Responsibilities included patent portfolio management, legal & contracts, licensing, etc., and most importantly, this person was the liaison with the technology transfer offices of the universities. Although the university TTO colleagues and external consultants were involved in specific cases on an ad hoc basis, the limited amount of manpower available and the lack of a process resulted in very reactive and case-by-case technology transfer activities. Inspired by the approach applied by the Fraunhofer Institute (GE) and their so-called "FDays" (Fraunhofer, 2017), which are focused on entrepreneurial exploration and validation with potential customers in a limited amount of time, and informed by the technology transfer and entrepreneurship literature and knowledge within the organization, a first trial case was initiated by the single technology transfer responsible in iMinds in September 2015. Based on the experiences of this first trial, a first version of the 101 programme

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was designed and rolled out within the merged imec in early 2016, backed up by a few key decision makers in an attempt to strengthen the technology transfer process within the new research institute. This decision was informed by the promise that the programme could generate multiple benefits: a more efficient (faster) and more effective (higher quality outcomes) technology transfer process, as well as more robust and transparent decision making. The target population is imec researchers who are doing a PhD or hold a post-doctoral position involving a technology that might have market potential. For a duration of 12 weeks, with (at least) 1 day a week spent on the project by the participating core team, imec researchers have the chance to "get out of the building" to assess the market potential of their technology, as well as identify (and where possible already start to work on) some weaknesses and challenges (e.g., at the team level). The programme consists of three phases with clearly specified goals and deliverables.

The name "101" was chosen for several reasons:

- 101 means an introduction; here, it is an introduction to entrepreneurship
- imec is engaged in digital research (1s and 0s)
- 1 on 1 refers to the close contact between the researchers and the lead coach
- at the end of the programme, a binary go/no-go decision is taken (1 or 0)
- it refers to the time investment of the researcher (12 weeks at 1 day/week)

Programme structure

The structured 101 process is depicted in Figure 1: it starts with a kick-off meeting, lasts for 12 weeks, and guides the research team through three phases. Each phase lasts for 3 to 4 weeks, and ends with a final decision meeting. The goal is to come to a go/no-go decision for further investments by imec and the universities involved. Every phase ends with a meeting where all stakeholders are invited and where the valorization team needs to present its findings. These meetings give the team a fixed deadline with clear deliverables and objectives. At the kick-off meeting, the team discusses the technology and the different possible use cases. An obvious but important aspect within the kick-off meeting is that all participants engage in careful agenda planning for the coming weeks.

The first phase is all about structuring the assumptions underlying different aspects of the use cases identified by the team. The team needs to map the different customer segments, the problem addressed, the need aspiration, the current alternatives, the barriers to adoption, and the unique selling point of their solution. This mapping can be done for one or more use cases. After 3–4 weeks, the first phase meeting is organized to allow the team to present its assumptions and its different cases. During this meeting, a discussion and iteration is facilitated with involvement from all stakeholders (professors, university technology transfer office, business developers, program director, living lab experts, innovation managers, etc.). This discussion feeds the involvement and buy-in of all stakeholders, leading to a growing enthusiasm of all parties involved when progress is being made by the teams.

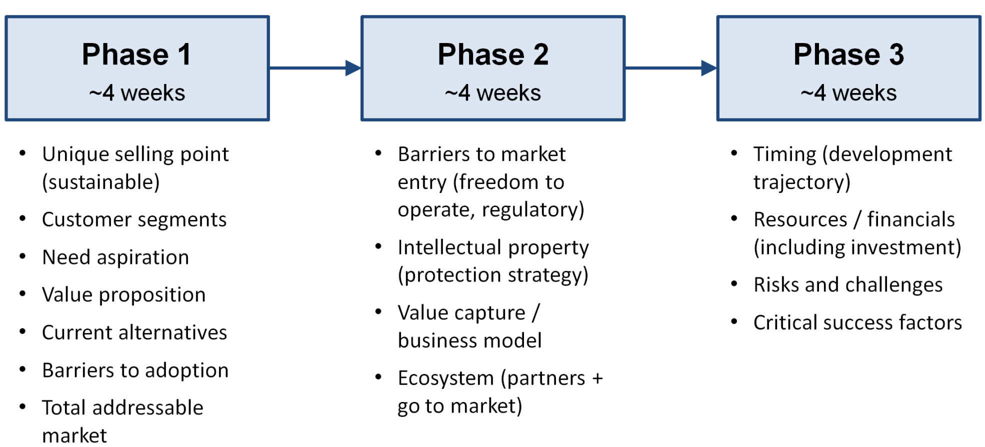

Figure 1. imec's structured 101 process and the areas of focus for each phase

The second phase is crucial because it consists of the valorization team trying to validate the assumptions by conducting interviews with the different parties of the ecosystem addressed by the use case. In preparation for these interviews, a topic guide is drafted in close collaboration with the user specialists from the imec.livinglabs department. In parallel with the interviews to validate the Phase 1 assumptions, the team needs to come up with a clear view on intellectual property (including a protection strategy and freedom to operate), a business model, and an overview of the ecosystem (e.g., partners and go-to-market strategy).

During the second phase meeting, the team presents its findings from the interviews and its assessment of whether or not the assumptions have been validated. This presentation is a more precise version of the Phase 1 presentation, because it includes a first draft of their intellectual property assessment, business model, and ecosystem overview. After the discussion, one use case and an associated value-capture model and go-to-market strategy are chosen to be the most promising. At this stage, the project team and steering committee should have validated arguments on why certain valorization alternatives (e.g., spin-off, licensing to a third party) are better than others.

During Phase 3, the team needs to work out the timing, the resources, and the critical milestones needed to execute the business model and the go-to-market strategy. The result of Phase 3 is a final presentation and pitch that needs to be delivered to the different decision takers who will decide on further investment in the case.

Team composition
There is a threefold project team structure with a specific composition (Table 2). The core team consists of the imec researcher(s) that created the technology, together with the manager of the fund for industrial research, and one dedicated hands-on lead to coach the team. This core team executes all the research and reports to the extended project team at the end-of-phase meetings. The extended project team also includes the professor or supervisors from the researcher(s), a technology transfer representative from the university of the researcher(s), a business unit (BU) owner from imec, and experts with different backgrounds from the imec research institute (e.g., experts on user research and incubation). The different skills, network, and other assets of these team members can be used as required during the process. The decision team includes the imec C-level decision makers that eventually decide whether the project can continue after the 101 programme, what resources are dedicated to the team, and what direction should be taken (e.g., further research, spin-off, licensing). The steering committee gathers at the start, at the end of each phase, and at the finish of the 101 programme.

Throughout the process, there is regular reporting on findings and progress, and an evaluation is made at the end of each phase by the steering committee. After each phase, the team reports and presents its findings to the extended team. By also including the university technology transfer people, potential conflicts of interest are avoided, such as discussions over intellectual property or on the amount of time the researchers spend on the 101 programme. The in-kind funding consists of the support and coaching by the experts. There is also a limited imec budget of about €5,000 available to each team for traveling and other relevant expenses during the process.

Outcomes of the 101 Programme

The first pilot project that was carried out along the lines of the 101 process (or at least with the main principles)

Table 2. Composition of the 101 team

Core Team	Extended Team (Steering Committee)	Decision Team
• PhD/Post doctoral researcher(s)	• Supervisors/professors	• imec management
• imec coach	• University technology transfer representatives	
• Industrial research fund manager	• imec business unit owner	
	• imec user research specialists	
	• imec business experts	

focused on Tengu, which is a platform to automate the setup of big data frameworks. Tengu was the result of research by an imec–UGhent PhD researcher. The technology surfaced during an iMinds' opportunity recognition workshop (ORW) in June 2015. The goal of these workshops is to help develop entrepreneurial and business skills by using and applying techniques and methodologies to real research results. After this three-day workshop, the PhD student wanted to undertake a more in-depth valorization of his research. At this point, the technology transfer office responsible for iMinds piloted a first version of the 101 process, which involved all stakeholders, a commitment of 1 day/week, a three=month timeframe, and clear deliverables. After these initial three months, the researcher applied for imec funding in February 2016. Although the first application was not successful, the jury was impressed by the quality of the file and encouraged the researcher to clarify some points of his business plan. A second application for funding in May 2016 was successful. The spin-off company Tengu was incorporated in July 2016, only 12 months after the researcher's first contact with imec's technology transfer office. Today, the Tengu team consists of 7 people and has made its first sales.

Having seen the need for and the effect of a follow-up program after a first introduction workshop, the imec TTO responsible further developed the programme and started four simultaneous 101 projects in January 2016, all of them having attended the November edition of the opportunity recognition workshop (ORW). This was done with the help of external consultants taking up the role as lead coaches. The closing meetings were attended by the senior management of iMinds who were impressed by the quality of the files. The only remark was that imec had all the necessary competences in house and it was not necessary to hire external consultants.

In light of the recent merger between iMinds and imec, and the installment of a product lifecycle process, the new imec organization wanted to test the 101 process in a more elaborate form. The main goal was to help prepare the teams for an investment decision. Figure 2 depicts the 101 programme within the broader imec technology transfer context.

A difference with the first 101 projects was that they did not come from the ORW, but were selected from a long list of 35 candidates, identified within the research institute, of which we eventually selected 10 projects to prepare an opportunity review (Gate 1). For the first execution of the 101 programme in the new imec organization, 4 teams participated in this programme alongside 6 other teams that also pitched at Gate 1 but did not follow the 101 programme. The jury was unanimous in thinking that the 101 teams pitched significantly better than the others. Their value propositions were much more concrete and their validation examples were more convincing.

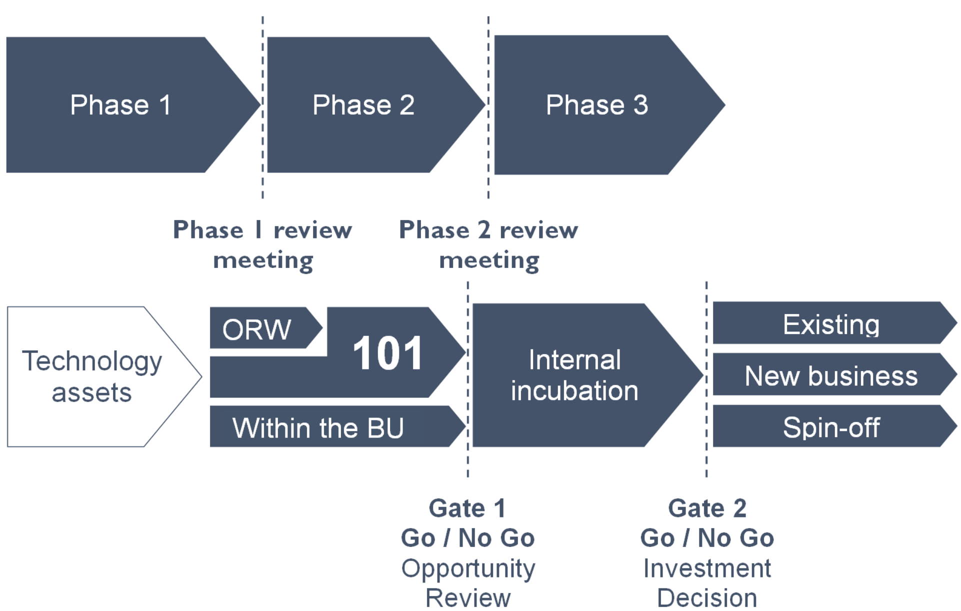

Figure 2. Technology transfer at imec, including the phases and positioning of the 101 programme

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One of these projects was called Quasar, which refers to technology that allows for all programmers to write code that can run on a graphics processing unit (GPU). GPUs are extremely fast for certain algorithms but are notoriously hard to program. Quasar makes it easier for researchers and developers to program and GPUs. Since 2013, the Quasar team had been looking for good ways to position its technology and to find a go-to-market strategy but had not been successful due to a combination of factors. It was decided to give the project a last chance to come with a strategy. Thanks to the revived enthusiasm, the heterogeneous extended team, and many structured interactions with potential users and customers, the project found a good niche market (in the automotive sector) and a first paying customer. The team shifted from the objective of starting a spin-off to an in-house research program within the industry.

Overall, the outcomes of the first 101 programmes are very positive. All four are continuing the entrepreneurial process: besides Quasar, a second project regarding an Internet of Things (IoT) solution is close to starting a spin-off, a third project is closing new licensing deals and has developed a strategic research programme to enable future technology transfer activities, and the fourth project is doing further investigations.

Evaluating outcomes

We conducted a survey of the four teams on the process and the 101 programme during the iteration that ran from December 2016 to February 2017. Twelve out of 26 respondents filled out the questionnaire. The support was given a score of 4 out of 5 by 72.7% of respondents, 18.2% gave the maximum 5/5, and 9.1% rated it at 3/5. On the question "Would you recommend your fellow researchers to take part in the imec 101 programme?", 100% (12) of the respondents said yes. Based on open questions, we discovered that the participating researchers believe they learned new skills and adopted a more entrepreneurial way of thinking. In particular, conducting interviews with potential customers took most of the researchers way out of their comfort zones. Therefore, the help of the coach and the user experts was needed in order to conduct these interviews effectively and translate the findings in terms of their value proposition and potential business model. This need was confirmed in an interview with an individual involved in technology transfer:

> *"The strongest part of the 101 process is the interviewing. This has to happen at an early stage. For academic researchers, some kind of a 'push' is needed in order for them to do this, as they are so busy with other work as well. Without this 'push', the majority will not engage in this market validation or potential customer exploration. The 101 process offers this kind of 'push', with concrete time pressure and deadlines. It is very intensive and difficult to combine with the other work, but it can offer a lot of value."*

Despite the short amount of time (12 weeks), a thoughtful investment decision can be made based on data gathered through the process. This timeframe allows for the organization engaging in technology transfer activities to "kill it faster"(if needed) and provide more focused investment in promising technologies and research. The time is short but the attention is focused, allowing the organization to quickly gauge potential. This approach yields more spin-offs, spin-outs, and flipped technology transfer, because the technology transfer budget and resources can be spent more efficiently.

Discussion: Lessons Learned

The 101 programme is designed to stimulate entrepreneurial action among academic researchers within the ecosystem of the imec research institute. The initial goal is the academic spin-off, but other options such as licensing are explored as well during the process. The programme does so by focusing on two specific aspects: a structured process and team composition.

The structured process, which is in line with the first five steps of Aulet (2013), allows the organization to identify the most promising markets and chose a primary "beachhead" market. To keep focus and structure, a business model brainstorm is held at the start of the programme, and the results from the consecutive research activities are reported within the frame of this initial workshop (see Rits et al., 2015). The research aims at need identification and market validation, combining the problem/solution fit and product/market fit stages, and is done through desk research and user interviews. It was exactly this structured approach that enabled Tengu to quickly accelerate the technology transfer activities where the foundation of generating a spin-off was laid in only three months. Related to the extended team composition, we also find support for the work of De Cleyn and colleagues (2015) given that the multi-disciplinary and multi-stakeholder teams had a positive impact on the project outcomes. By involving the universities, they felt more committed to the project and were more inclined to allow their researchers to dedicate time to it. The limited timespan of 12 weeks also fostered a positive attitude from, for example, the promoters of the researchers, because it did not distract them too much from their publishing duties. For the researchers themselves, the process allowed them to make a more deliberate choice between an entrepreneurial or an academic career. Also, the presence of the university technology transfer officers is mutually positive: the process helps them in their work, but they can also provide tailored assistance during the process given that they also tend to have a history with the participating researchers. Finally, the research institute itself also benefits because, in a limited amount of time, a data-based decision can be made regarding further investment. In this regard, the disadvantages of academic spin-offs, as identified by Smilor (1987), are overcome in the 101 programme. In the example of Quasar, it was clear that, by involving other experts and all stakeholders in the steering committee, the quality of the project increased significantly and the team could finally find a feasible go-to-market strategy. The interviews, which were facilitated by the different participating stakeholders, offered them the necessary data to choose a beachhead market for their technology. Without this help, the team was unable to focus for more than three years.

The 101 programme seemed to offer added value over a standard approach. The clear deadlines and deliverables, the involvement of all (internal) stakeholders in the process and the focus on (potential) customer exploration and validation were regarded as the strong points. By limiting the length of the process to only 12 weeks, a sense of urgency is created which forces the entrepreneurial teams into a constant battle between deep investigation and "quick and dirty" validation. This observation is in line with the principles of the lean startup by Ries (2011), focusing on quick experimentation and iteration of the value proposition. A very recent study by Frederiksen and Brem (2017) validated the majority of these principles and statements, and concludes that there is empirical and academic support for repeated, validated experimentation. The 101 projects only reach the exploration stage, but in theory, they should be ready to engage in an experimental mode at the end of the programme. An important element are the gate review meetings with C-level people to follow-up on the progress of the files. The involvement of these people generates commitment from their side and allows the projects to tap into their knowledge and resources. Through the clear tasks and deliverables for the different projects, these decision makers can more easily follow-up on the projects and decide to stop a project if not enough progress has been made or not enough commitment is present in the entrepreneurial team.

However, there are still several areas for improvement. One was an uneven knowledge of the process by the participating team members and stakeholders. In long-standing successful technology transfer activities such as at MIT (Aulet, 2013) or Fraunhofer (Rombach, 2000), the specific entrepreneurial process and approach is infused with most activities of the institution. At this moment, the 101 process is not well enough documented and is not known by most the researchers at imec, because it was a bottom-up approach taken by the initiative of those responsible for technology transfer. Also, in the current process, there is no "cohort effect" between the different teams, because they do not interact with each other. There was interaction between the internal imec support people, but for the researchers themselves, there were no formal interaction opportunities. Also, in terms of researchers, there seemed to be a lack of "leaders", or people who could actually take the lead in an eventual startup. The majority saw themselves in a supportive role, but not as the lead entrepreneur. Finally, related to this point, follow-up after the programme is also difficult. Given that the researchers have been less involved in their academic activities, immediately after the programme, they are expected by the university to re-engage with their previous activities. This expectation hinders the process of continuing towards the next stage of becoming a spin-off. However, by its open and bottom-up character, these issues will be dealt with in the next batch of projects entering the 101 programme.

Conclusion

Within this article, we have described the 101 programme, a structured technology transfer process in the early stages of opportunity discovery and entrepreneurial action, which is primarily aimed at academic spin-offs within the context of a research institute. Key elements in the programme are: i) a limited amount of time to complete the process, ii) a clearly structured process that is based on step-by-step exploration, and iii) validation of assumptions regarding primary markets, their needs, and the fit with the technological solution. Alongside the process, team composition is considered in a specific manner. By having a threefold team composition, relevant stakeholders and decision makers within the research institute and within the universities are involved, as well as business and user experts, to assist during the process. Involving key decision makers from the start increases the visibility and opens certain opportunities within the organization. The team structure also allows for the participants to source relevant knowledge and assets when necessary – without the need to have all these capabilities already in the core team. It also offers some freedom to the participants as to how they reach the deliverables linked to the three phases. However, future research and future work is still necessary. The follow-up after the programme needs improvement given that the risk remains high that researchers will fall back to their old routines after the programme, The programme also needs a stronger basis within the organization and should be implemented across the entire organization, as famous foreign examples such as Fraunhofer and MIT prove is important. Nonetheless, the 101 programme has shown a lot of potential with the first participating teams and confirms the literature that a process-based approach combined with focused team composition facilitate academic technology transfer.

The major contribution of the 101 programme lies in the combination of the three elements: the process, the team composition, and the coupling of a limited time-frame with regular follow-up meetings. By piloting and iterating the programme from a bottom-up perspective, the programme is able to create a fit with the overall goals of the organization and it also enables learning effects for the participants, who re-use the skills and knowledge obtained by their participation, as well as for the organization, where different people and profiles interact and get to know each other and the various assets and resources within the organization. Therefore, we see great potential in a structured technology transfer process and the possibility of experimenting with a technology-transfer initiative on even a very small scale.

About the Authors

Dimitri Schuurman is the Team Lead in User Research at imec.livinglabs and a Senior Researcher at imec – MICT – Ghent University in Belgium. He holds a PhD and a Master's degree in Communication Sciences from Ghent University. Together with his imec colleagues, Dimitri developed a specific living lab offering targeted at entrepreneurs in which he has managed over 100 innovation projects. Dimitri is responsible for the methodology and academic valorization of these living lab projects and coordinates a dynamic team of living lab researchers. His main interests and research topics are situated in the domains of open innovation, user innovation, and innovation management. His PhD thesis was entitled *Bridging the Gap between Open and User Innovation? Exploring the Value of Living Labs as a Means to Structure User Contribution and Manage Distributed Innovation.*

Stan De Vocht is the Innovation Manager at imec and was previously the Technology Transfer Manager at iMinds. Stan holds a Master of Law (LL.M.) and a Master of Intellectual Property and has been working in the technology transfer sector since his graduation in 2005. Stan has taken the initiative in the creation of the 101 programme and has helped several projects from technology to business.

Sven De Cleyn graduated with a Master in Commercial Engineering and started his professional career at the University of Antwerp, where he conducted research on high-tech spin-offs from European universities. He joined iMinds (merged with imec since October 2016) in 2011 as Technology Transfer Manager. He is in charge of the imec.istart business acceleration program in which he supports new spin-offs and startups. The program is recognized by UBI Global as one of the leading accelerators worldwide. Today, Sven is also part-time professor in (high-tech) entrepreneurship at the University of Antwerp.

Aron-Levi Herregodts is a user specialist at imec.livinglabs and an affiliated researcher at imec-MICT-UGhent. He obtained master's degrees in Communication Sciences (2013) and Complementary Business Economics (2014). As a user specialist with imec.livinglabs, his role is to translate multi-actor behaviour, needs, and wants to tangible recommendations to provide structure to the innovation process of startups, SMEs, and large organizations. His main interests include open innovation, user innovation, organizational learning, intermediary activities, and user-centric design and methodologies. He has specific interest in the configuration of intermediary learning activities based on the end user with innovation-relevant actors for distinct types of entrepreneurs and innovations.

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References

Aulet, B. 2013. *Disciplined Entrepreneurship: 24 Steps to a Successful Startup*. Chichester, UK: John Wiley & Sons.

Barney, J., Wright, M., & Ketchen Jr, D. J. 2001. The Resource-Based View of the Firm: Ten Years after 1991. *Journal of Management,* 27(6): 625–641. https://doi.org/10.1177/014920630102700601

De Cleyn, S., Braet, J., & Klofsten, M. 2015. How Human Capital Interacts with the Early Development of Academic Spin-Offs. *International Entrepreneurship and Management Journal,* 11(3): 599–621. http://dx.doi.org/doi:10.1007/S11365-013-0294-Z.

De Cleyn, S., Tietz, R., Braet, J., & Schefczyck, M. 2008. *Report on the Status of Academic Entrepreneurship in Europe, 1985–2008*. Puurs, Belgium: UniBook.

Di Gregorio, D., & Shane, S. 2003. Why Do Some Universities Generate More Start-Ups than Others? *Research Policy,* 32(2): 209–227. https://doi.org/10.1016/S0048-7333(02)00097-5

European Commission. 2017. European Innovation Scoreboard. *European Commission*. Accessed August 1, 2017: http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

European Union. 2015. *Europe 2020 Strategy*. Brussels: European Union. https://ec.europa.eu/info/strategy/european-semester/framework/europe-2020-strategy_en

Flemish Government. 2016. *STI in Flanders: Science, Technology & Innovation. Policy & Key Figures 2016*. Brussels: Flemish Government, Department of Economy, Science & Innovation. http://ebl.vlaanderen.be/publications/documents/87170

Flemish Government. 2017. Strategische onderzoekscentra richtten afgelopen drie jaar 33 spin-offs op. *Department of Economy, Science & Innovation,* April 28, 2017. Accessed August 1, 2017: http://www.ewi-vlaanderen.be/nieuws/strategische-onderzoekscentra-richtten-afgelopen-drie-jaar-33-spin-offs-op

Fraunhofer. 2017. Fraunhofer Days (FDays). *Fraunhofer Venture*. Accessed August 1, 2017: https://www.venturelab.fraunhofer.de/de/fuer-forschende/unternehmerisches-handeln/fdays.html

Frederiksen, D. L., & Brem, A. 2017. How Do Entrepreneurs Think They Create Value? A Scientific Reflection of Eric Ries' Lean Startup Approach. *International Entrepreneurship and Management Journal*, 13(1): 169–189. https://doi.org/10.1007/s11365-016-0411-x

Hollanders, H., Es-Sadki, N., Buligescu, B., Leon, L. R., Griniece, E., & Roman, L. 2014. *Regional Innovation Scoreboard 2014*. Brussels: European Union. http://dx.doi.org/10.2769/88893

Lambricht, W. H., & Teich, A. H. 1976. Technology Transfer As A Problem In Interorganizational Relationships. *Administration & Society,* 8(1): 29–54. https://doi.org/10.1177/009539977600800103

McMullen, J. S., & Shepherd, D. A., 2006. Entrepreneurial Action and the Role of Uncertainty in the Theory of the Entrepreneur. *Academy of Management Review,* 31(1): 132–152. http://doi.org/10.5465/AMR.2006.19379628

Shah, S. K., & Tripsas, M. 2007. The Accidental Entrepreneur: The Emergent and Collective Process of User Entrepreneurship. *Strategic Entrepreneurship Journal,* 1(1-2): 123–140. http://doi.org/10.1002/sej.15

Shane, S. 2004. *Academic Entrepreneurship: University Spinoffs and Wealth Creation*. Cheltenham, UK: Edward Elgar.

Ries, E. 2011. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. New York: Crown Business.

Rits, O., Schuurman, D., & Ballon, P. 2015. Exploring the Benefits of Integrating Business Model Research within Living Lab Projects. *Technology Innovation Management Review,* 5(12): 19–27. https://timreview.ca/article/949

Rombach, D. 2000. Fraunhofer: The German Model for Applied Research and Technology Transfer. In *Proceedings of the 2000 International Conference on Software Engineering:* 531–537.

Rothwell, R., & Robertson, A. B. 1973. The Role of Communications in Technological Innovation. *Research Policy,* 2(3): 204–225. https://doi.org/10.1016/0048-7333(73)90003-6

Smilor, R. W. 1987. Commercializing Technology through New Business Incubators. *Research Management,* 30(5): 36–41.

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