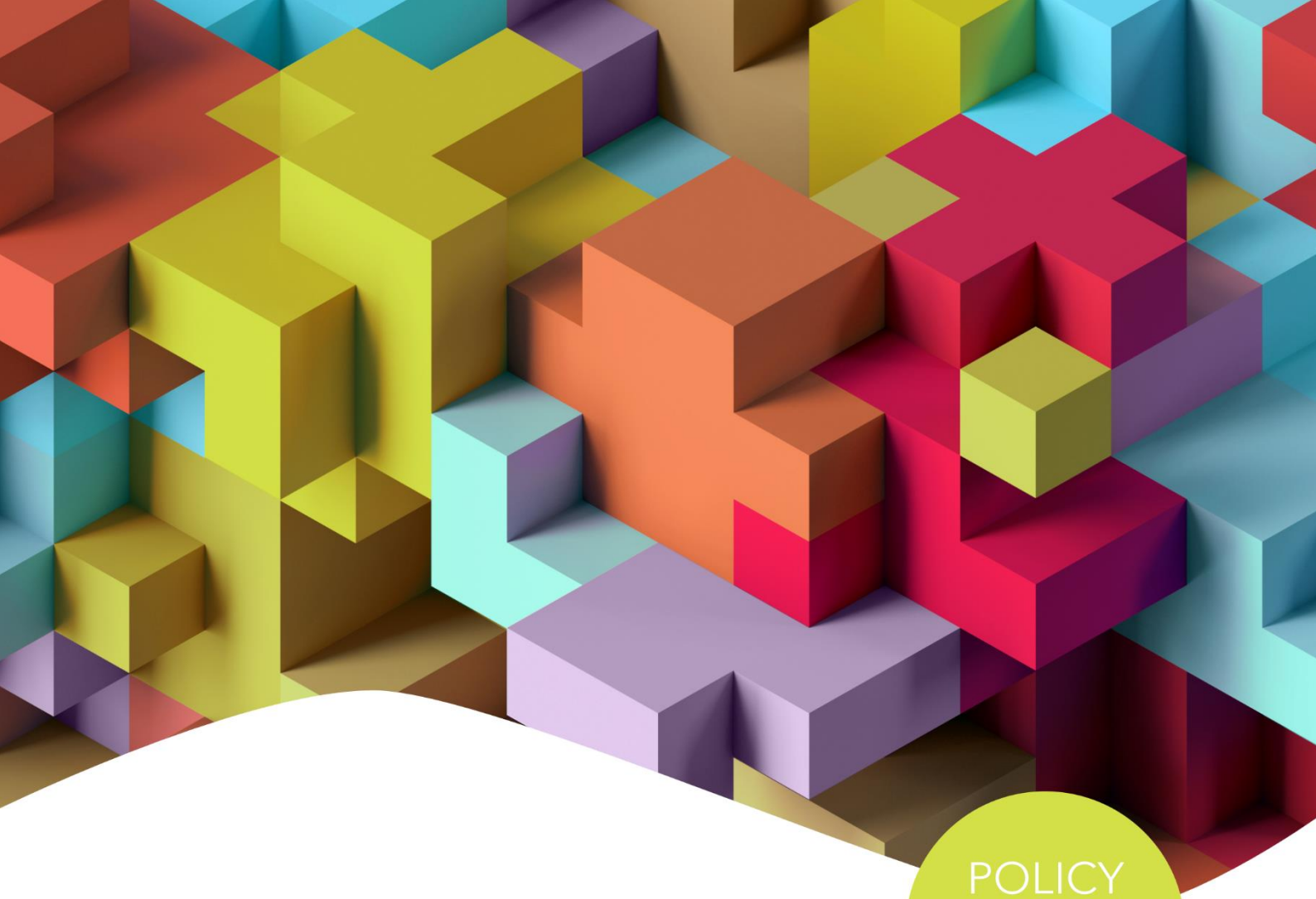

POLICY CASE STUDY

RTO programmes to promote spin-offs – the case of TNO in the Netherlands

Case study contribution to the OECD TIP Knowledge Transfer and Policies project

Marcel de Heide, Eddy Zwier, Hans Boumans, Erik Drop, Albert van der Steen

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RTO programmes to promote spin-offs - the case of TNO in the Netherlands: Case study contribution to the OECD TIP Knowledge Transfer and Policies project

Authors: Marcel de Heide, Eddy Zwier, Hans Boumans, Erik Drop, Albert van der Steen

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Executive summary

TNO's strategy supporting technology transfer, and its scope, governance, supporting structure and corresponding tools is in transition. TNO defined a dedicated program for this purpose in 2016, entitled Tech Transfer Program, which "serves to develop high-potential new inventions into business cases, drafting a proof-of-concept where necessary. This process also includes determining the most efficient way to launch the new product or service into the market: By means of transfer to a new or an existing company."

The Tech Transfer Program implies a shift in focus: from spin-out to spin-offs. It entails therefore "a new, more structured approach to technology transfer with better support during the formation of spin-offs and their preparations to enter the market. Staff are encouraged to bring promising ideas to the central Tech Transfer team, which can then facilitate them. Step by step, interesting concepts are distilled into a business plan and, if necessary, an entrepreneurial backer is sought. After each step the project is assessed by a Tech Transfer board made up of TNO personnel and outside experts, which also allocates resources to those with potential."

Implementation of the Tech Transfer Program was supported by the set-up of a dedicated Tech Transfer team in 2017 "to manage this programme as efficiently as possible and boost the overall process. The Tech Transfer team possesses expertise in IP assessment, licensing, venturing, new business development, business law, labour affairs, finance and real estate. Effective, tailor-made management by TNO enables the TNO innovations to receive maximum support in a successful market launch."

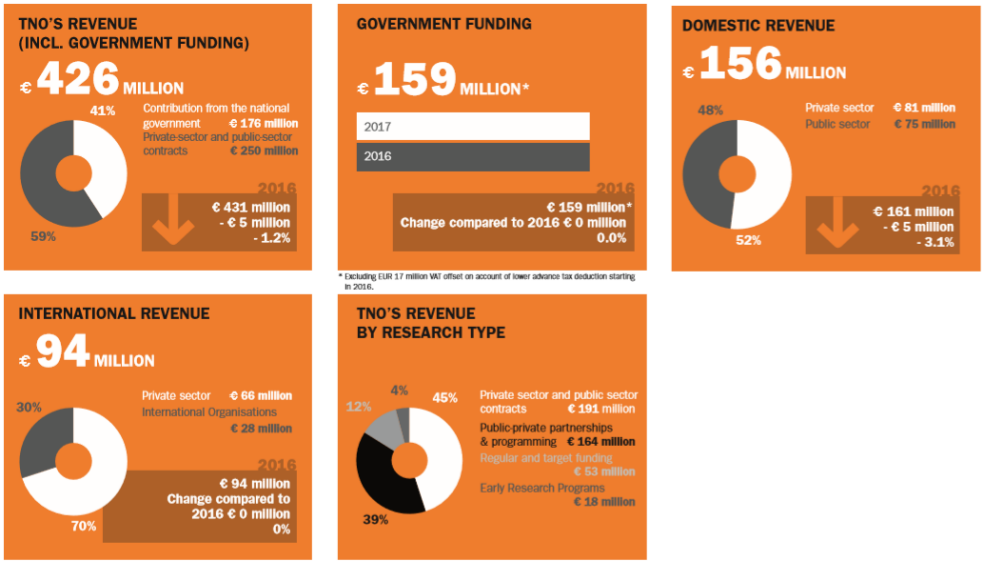
The goal of the Tech Transfer Program is to introduce *more* TNO technology *faster* to the market. The program therefore addresses the creation of spin-offs and licencing out of technology / knowledge. The Tech Transfer Program focuses on the 'pre-seed' stage in the financing cycle: the phase prior to the actual launch of the new company. During the pre-seed phase, preparatory activities are conducted, such as carrying out market research, formulating a business plan and making agreements between the spin-off, TNO, and any other stakeholders.

Introduction

The Netherlands Organisation for Applied Scientific Research (TNO) was established under Dutch law in 1932. As an organisation operating under public law, it has an independent position within the Dutch innovation system. TNO's mission is "[to connect] people and knowledge to create innovations that boost the competitive strength of industry and the well-being of society in a sustainable way."[1]

TNO is a not-for-profit knowledge organisation. However, in order to ensure its continuity, a certain level of operational profit should be generated to fund investments and ensure continuity in knowledge development. About 37% of all TNO's income originates from national government funding. A bit over 16% results from 'public contract work' (i.e. primarily collaborative research with industrial partners) from Dutch programmes; half of that from EU and other international (competitive) research funding programmes. Contract research for Dutch firms constitutes about 18% of the budget, 19% results from income generated from projects for foreign industrial actors. The rest (i.e. 3%) originates from licensing etc.[2]

Figure 1. Key financial data TNO in 2017 (source: TNO Annual Report 2017)



The research capacity of TNO is clustered within 9 different units: i) buildings, infrastructure & maritime; ii) circular economy and the environment; iii) defence, safety and security; iv) 'ECN part of TNO', which addresses research in the field of 'energy';[3] v) healthy living; vi) industry; vii) information and communication technology; viii) strategy analysis and policy; ix) traffic and transport.

[1] See www.tno.nl.

[2] Source: Rathenau (2018), figures for 2017 (see www.rathenau.nl).

[3] ECN (Energy Centre the Netherlands) is an RTO on energy related research. It merged with TNO on the 1st of April 2018.

Research conducted by TNO is structured into four main categories, according to objectives, governance structure, modality of financing, and legal structure: i) Early Research Programmes (ERPs); ii) shared research, meaning public-private and public-public partnerships and including Joint Innovation Centres (JICs); iii) contract research; and (iv) technology transfer (see Table 1).

Table 1. Clustering of research activities within TNO

	i) Early Research Programs	**ii) Shared research**	**iii) Contract research**	**iv) Technology transfer**
Research phase	Embryonic	Growth	Mature	Transfer
TRL	3–5	4-6	6-7	4-9
Focus	Focus Knowledge development: i) with partners; ii) in PPS where possible; iii) feasibility study	Knowledge development: i) with partners; ii) in PPSs	Application of knowledge: i) for individual private/public client; ii) development and application of technology	Exploitation of knowledge: i) IP license; ii) spin-off (high tech start-up) (TRL 4-7); iii) spin-out of mature technology (TRL 8-9)
Outcome	Insight into applications in various domains	Application in selected "use cases", patents or spin-off technology	Concrete product and/or service	See above
Dedicated state funding[4]	ERP + targeted funding	Research Co-operation Funds + targeted funding	n/a	n/a
Business model	Cost price	Cost price	Primarily price based on costs plus margin	Primarily IP / royalty income, equity and sales revenue

Table 1 indicates that TNOs research covers all phases of the innovation cycle. The final phase of 'technology transfer', when TNO "valorises its knowledge" (from 'TNO Strategic Plan 2018 - 2021') is most relevant within the context of this report.[5] Three different modalities of technology transfer are identified to commercialize Intellectual Property (IP): (i) licensing of specific knowledge originating from TNO activities by means of dedicate agreements with entities (e.g. firms); (ii) creating a spin-off company (i.e. establishment of a new company specifically to further develop and commercialize knowledge originating from TNO activities); (iii) a spin-out (i.e. transfer of existing activities of TNO to a dedicated company, defined as a "transfer of undertakings" according to article 7:622 of the Dutch Civil Code, in which case TNO subsequently terminates these respective activities). Note that a TNO spin-off could involve TNO staff as well as an equity share held by TNO, but this is not a precondition within the framework of the adopted strategies for IP commercialization.

Objective of technology transfer in general is to ensure that TNO innovations are converted into business economic activity and high-quality employment. The underlying principle in the subsequent actions of TNO in this context is that "once a technology is mature, the market [should] take […] over." (from 'TNO Strategic Plan 2018 - 2021'). These actions constitute TNO's public role "to strengthen the knowledge position of the Dutch economy as a whole. This requires not only that [TNO] protect[s] research findings with commercial potential, but also that — subject to reasonable conditions — [TNO] disseminate[s] the knowledge [it] develop[s] as widely as possible."

[4] This does not refer to competitive research programmes

[5] See www.tno.nl.

The strategy supporting technology transfer, and its scope, governance, supporting structure and corresponding tools is in transition. Main tool up to the beginning of 2017 was 'TNO Companies' (TNO Bedrijven B.V.). The mission of this entity, implemented as a 'business incubator' was to pursue "impact and value creation through the valorisation of TNO research, in areas where others are unwilling or unable to act independently." (from 'TNO Annual Report 2016')[6] This mission has served as a guideline for several years in the operation of TNO Companies. Three strategies were subsequently adopted to support this mission: (i) the set-up of Joint Ventures, in which TNO Companies involves at least one other market player; (ii) the creation of TNO Spin-outs, involving 'repetitious work' which is no longer in line with TNO's R&D environment; (iii) the creation of start-ups, with TNO employees who start their own business based on a license.

Up to the beginning of 2017 TNO owned 100% of the shares in TNO Companies. In order to ensure a division in the relationship between TNO and TNO Companies, the management and the business operations were organised independently of each other under the organisation's articles of association. The result of the status of a two-tier company with a Supervisory Board was that TNO Companies operated 'at arm's length' from TNO. A number of companies have been established over the years under the umbrella of TNO Companies, particularly spin-outs. At the beginning of 2017, its portfolio included 27 firms employing more than 1100 people.

The structure and governance of TNO Companies however also had its drawbacks. Regulations stipulate that financial results of the firms in the portfolio in which TNO Companies is a majority shareholder have to be included in the financial statements of TNO. This affects TNO when looking for (private) financing of its activities. Therefore, TNO decided to initiate the sale of a majority of its shares in TNO Companies. The aim was to sell such shares to one private party, thereby obtaining better access to finance for TNO Companies and creating a clear governance structure between TNO and TNO Companies. Furthermore, the goal was to attract a private party with significant competences in the field of growing innovative companies.

TNO subsequently decided to change its approach towards technology transfer. It defined a program for this purpose in 2016, entitled Tech Transfer Program, which "serves to develop high-potential new inventions into business cases, drafting a proof-of-concept where necessary.[7] This process also includes determining the most efficient way to launch the new product or service into the market: By means of transfer to a new or an existing company." (from 'TNO strategic Plan 2018 - 2021') The program builds on an assessment of similar programs in Europe, such as the 'Fraunhofer Ventures'.[8] It has been designed such that it addresses the specific characteristics of TNO, and the Dutch innovation system.

The Tech Transfer Program implies a shift in focus: from spin-out to spin-offs. It entails therefore "a new, more structured approach to technology transfer with better support during the formation of spin-offs and their preparations to enter the market.

Staff are encouraged to bring promising ideas to the central Tech Transfer team, which can then facilitate them. Step by step, interesting concepts are distilled into a business plan and, if necessary, an entrepreneurial backer is sought.

[6] See www.tno.nl.

[7] See www.tno.nl.

[8] Peterse, L. (2017) *Spin-off incubation at the Netherlands organization for applied scientific research TNO, a case study on the new Technology Transfer program*. Master Thesis

After each step the project is assessed by a Tech Transfer board made up of TNO personnel and outside experts, which also allocates resources to those with potential." (from 'TNO strategic Plan 2018 - 2021')

Implementation of the Tech Transfer Program was supported by the set-up of a dedicated Tech Transfer team in 2017 "to manage this programme as efficiently as possible and boost the overall process. The Tech Transfer team possesses expertise in IP assessment, licensing, venturing, new business development, business law, labour affairs, finance and real estate. Effective, tailor-made management by TNO enables the TNO innovations to receive maximum support in a successful market launch." (from 'TNO Annual Report 2016').

In December 2016 TNO and First Dutch signed an agreement for the sale of the majority of shares in TNO Companies. As of that date, TNO Companies was named First Dutch Innovations (FDI). This strategic partnership between TNO and FDI will give a further boost to the financial and commercial muscle of TNO Companies. Rationale for this sale is the fact that: (i) First Dutch is an active investor with a broader scope than TNO spin-offs alone, thus making its knowhow available to other parties wanting to bring innovations to the marketplace; (ii) with a wider "pipeline" for potential spin-offs, FDI should be able to grow faster as a "launch platform"; (iii) the new organization is closer to the market and able to bring in outside commercial and financial expertise; and (iv) outside financing for growth, value creation and value realization has become available.

Additional initiatives have been implemented to further strengthen the strategy to support technology transfer, and specifically the creation of spin-offs and spin-outs. TNO established a database with contact data and other information of over a hundred potential investors. Contact has been made with a large section of this sample to acquire further insight on their strategy concerning early stage investments.

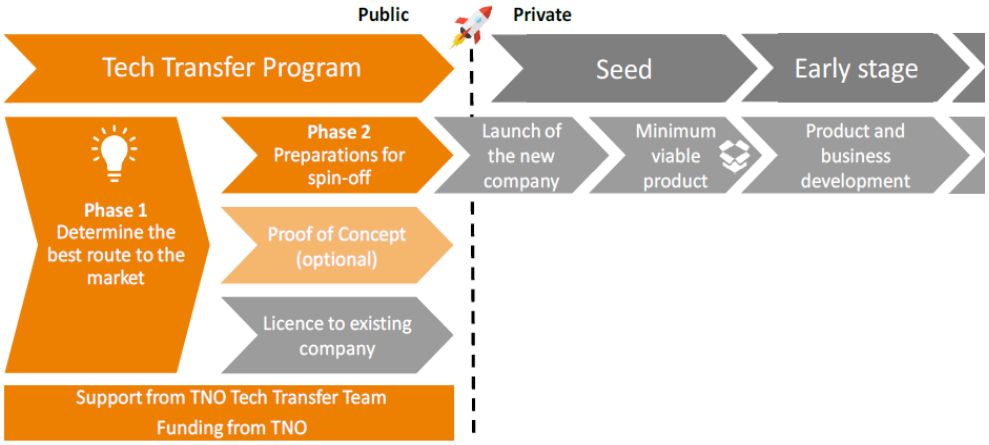
Together with the four Technical University, TNO established a technology fund called InnovationIndustries, which will invest €75 million in about 20 high-tech firms that indicate potential for successful growth (starting from its set-up in July 2017).[9] The fund aims at supporting companies that contribute to solving societal challenges that refer to climate change, supply of food, health, etc. Participants also include regional development funds and agencies (e.g. PPM Oost Topfonds Gelderland). Besides providing investment opportunities, TNO is a minority shareholder (with 2% of the shares). Involvement of TNO is relevant for the fund to because it provides the fund with a certain profile that attracts involvement from private investors.

[9] See www.innovationindustries.com.

1. Strategy to support spin-offs

The goal of the Tech Transfer Program is to introduce *more* TNO technology *faster* to the market. The program therefore addresses the creation of spin-offs and licencing out of technology / knowledge. The Tech Transfer Program focuses on the 'pre-seed' stage in the financing cycle: the phase prior to the actual launch of the new company. During the pre-seed phase, preparatory activities are conducted, such as carrying out market research, formulating a business plan and making agreements between the spin-off, TNO, and any other stakeholders (see Figure 2).

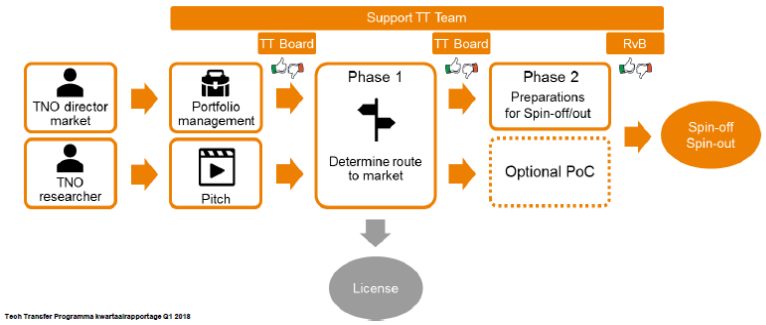
Figure 2. Role Tech Transfer Program in the financing cycle of start-ups



1.1 Phases in the Technology Transfer Program

The Tech Transfer Program involves a number of phases an applicant has to go through (see Figure 3). This section describes these phases in detail (from the TNO Handbook Tech Transfer Program). There is a focus on the pre-seed phase: as to ensure an increased number of propositions (i.e. by supporting the development of a strong business case); to get more researchers involved in entrepreneurial activities (i.e. by allowing for easy access to the program and supporting the first stages of potential entrepreneurial activities); and because support in the seed / early stage phase is already well available.

Figure 3. Structure of the Tech Transfer Program



1.2 Preparation: submitting of an application

Applications for the Technology transfer Program can be submitted at any time during the year by: (i) any TNO employee who believes an innovation should be launched on the market via the Tech Transfer Program; or (ii) a market director who elects to take the spin-off route based on strategic portfolio management. An application entails a completed application form and a video pitch. Propositions admitted to the program must have a Technology Readiness Level (TRL) of at least 4.

With the application, representatives of the spin-off apply for both financial and business support that will help them go through two predefined and consecutive phases towards the launch of the new company. Supplementary funding can be requested in an additional procedure if R&D activities are necessary for a Proof of Concept (PoC, e.g. to strengthen the IP position, making it a more attractive proposition for investors). A 'launching customer' and additional external funding for the PoC are two conditions for this supplementary funding.

Actors involved in the Tech Transfer Team are supported by the above-mentioned Tech Transfer Team, that provides advice and support with regard to IP assessment, licensing, new business development, venturing, business law, labour affairs, funding, and real estate. The programme is governed by a dedicated Tech Transfer Board. Their primary role is to assess all technology transfer initiatives, and decide on their admittance to, and continuation in the program (see Figure 3).

Phase 1: Determine the best 'route to the market'

Upon approval of the application for admission to the program by the Tech Transfer Board, a maximum budget of EUR 30,000 is allocated for the implementation of Phase 1. The objective of this phase is to define the optimal strategy to bring the technology that constitutes the basis for the foreseen spin-off to the market. A dedicated project team is therefore established by the applicant, that will implement activities aimed at assessing the market (i.e. the different 'routes to the market'), the technology (i.e. the TRL level), and the business case of the potential spin-off.

The project team will be supervised and supported in conducting the assessment by the Tech Transfer Team. In addition, the project team has the possibility to seek external support, e.g. by hiring a market-research agency, an external entrepreneur or by participating in YES!Delft's Validation Lab.[10]

This project team summarizes the results of its assessment with the help of a 'slide deck' that provides a template for a standardised approach for the presentation of its proposal for a spin-off. This slide deck includes instructions, tips, and guidelines. The results are subsequently presented to the Tech Transfer Board for approval.

[10] YES!Delft is an incubator focussing start-ups involved in 'complex technology'. It offers services that support the process to 'bring a product to the market as fast as possible'. From their website (www.yesdelft.com): "By offering the right resources, we help technology start-ups faster towards their market/product fit, faster to a launching customer and faster towards investment." It supports early stage start-ups find their market/product fit in a pre-acceleration program (Validation Lab) and enables later stage start-ups to accelerate to further stages of maturity (Accelerator Program). TNO is a minority shareholder and founding partner of YES!Delft. TNO has opted to not set-up its own incubator program, as it allows TNO-teams to get in contact with other start-ups.

Phase 2: Preparations for spin-off

After approval of the results of phase 1 and the subsequent application for phase 2 by the Tech Transfer Board, the project team is ready to enter the next stage towards setting-up the spin-off. A maximum budget of EUR 50,000 will be allocated to fund the phase 2 activities, which are to be conducted over a period of six months.

During phase 2, the project team will draft a business plan (including a financial plan), a dedicated spin-off team will be formed, and agreements on various aspects of collaboration will be made between the spin-off, TNO, and any other stakeholders. These agreements address issues like licensing of technology, equity participation and governance, contracting of staff, use of brand name and trademarks, and use of buildings and equipment.

The project team summarizes the business plan according to a dedicated template provided by a slide deck designed such that it is ready for pitches to investors. The ultimate decision on the launch of the spin-off is subsequently made by the TNO's Executive Board (Raad van Bestuur (RvB) in Dutch) based on the business plan and the foreseen agreements.

1.3 Additional support

The applicants are supported in the above mentioned steps, as well as with other aspect of the process towards starting their spin-off by means of (additional) services.

Licensing

TNO technology is generally made available to the spin-off by means of a License Agreement between TNO (licensor) and the spin-off (licensee). In the License Agreement, arrangements will be made regarding the Licensed Products, the Field of Use, in which countries the licence is valid, the duration of the licence, whether or not the licence is exclusive, etc. In addition, arrangements will be made regarding the licence fees. TNO has two basic conditions for license agreements with spin-offs: i) they must be start-up-friendly; ii) they must comply with the EU State Aid rules. This implies that the licence often include a fee system based on net sales (i.e. the spin-off only pays fees to TNO in case if turnover is realized during the use of the licence.

Equity participation & governance

TNO in general participates in a spin-off as a minority shareholder. Arrangements will be made regarding the conditions of this minority interest and the distribution of control between TNO and the other participants. One important restriction is that TNO will not make cash investments in the spin-off. Furthermore, TNO will not conduct executive duties regarding the spin-off: these must be conducted by the members of the spin-off team. For supplementary funding, the spin-off is the entity responsible for seeking investors (for equity) and financiers (for debt) with the support of the Tech Transfer Team.

Staffing and labour affairs

The initial period of new companies is often characterized by uncertainty concerning the feasibility of the entity. For this reason, employees working on a spin-off sometimes ask if they can retain their job at TNO on a full-time or part-time basis, either for a specified period or on a permanent basis. If the spin-off is successful, then the intention is that these employees leave their jobs at TNO and fully focus on the spin-off. These are known as

'hybrid employees'.[11] For the aforementioned purposes, arrangements can be made in relation to ancillary activities, part-time employment, and termination of employment. This feature of the program seems highly appreciated by these employees, as it addresses the uncertainties of leaving a stable job position, and could subsequently be considered as an example for other programs.

Use of brand name & trademarks

Spin-offs often indicate that they would like to continue using the TNO name and logo in their communications. The TNO trademark is nationally and internationally registered and therefore has a legally protected status. This applies to the TNO name and logo, as well as the slogans 'Innovation for life' and 'Innovated with TNO'. TNO has formulated a framework in which guidelines for the use of the TNO trademark have been defined, with issues such as the equity distribution between TNO and the spin-off playing a decisive role in determining what is and is not permitted. These arrangements are formulated in a license contract, the basic principle of which is ensuring strong market positioning for both the spin-off and TNO.

Use of real estate & facilities

In some cases, it is decided to allow the intended spin-off to continue making use of TNO facilities such as offices or laboratory spaces. The basic principle in this regard is that the spin-off will be accommodated as TNO divisions, with a service package under equal terms and market-based rates. It can also occur – in the event of a spin-out – that specific research facilities are transferred to the new company. In order for TNO to make an offer, insight is required into the following aspects: necessary square meterage, type of rooms (facilities), adjustments to the rooms (G/W/E), number of FTEs, desired rental period, required permit(s), and specific wishes and requirements regarding facilities services and ICT services (other than the standard range of TNO products and services).

Further collaboration with TNO

In order to introduce innovations into the market, spin-offs and licences to existing companies are important to TNO. This is the final step in the innovation cycle in which TNO wishes to play a role. Subsequent to this, the spin-off is solely responsible for the commercialization of the innovation via the introduction of innovative products and services into the market. Naturally, TNO is open to further collaboration with the company, which can be conducted via public-private partnerships, contract research, etc. Despite the spin-off's activities often being continuations of typical TNO work, it is important that the impact of the desired spin-off on the current TNO organization and its clients is determined in advance, such as the impact on the strategy of the TNO roadmap, research group, and funding in question.

The results of this impact assessment will be used for various purposes, such as formulating agreements between the spin-off and TNO.

[11] See www.debaaningenieurs.nl.

2. Results achieved so far

The objective of the Technology Transfer Program is to bring between five and ten spin-offs to the market each year by 2021. Furthermore, the program intends to enhance valorisation of know-how through licensing agreements, increasing their contribution to TNO's turnover to at least 2 per cent. With the additional funds raised by the sale of shares in TNO Companies, the program is further enhanced. Collaboration is sought with investment funds, universities and regional development corporations. Alongside First Dutch Innovations, important partners in this field include Yes!Delft and the Innovation Industries Fund. Ultimately, overall efforts and financial support should generate revolving returns in the form of licensing income and revenue from selling shareholdings in spin-offs.

Table 2. Results Technology Transfer Program 31/12/2017

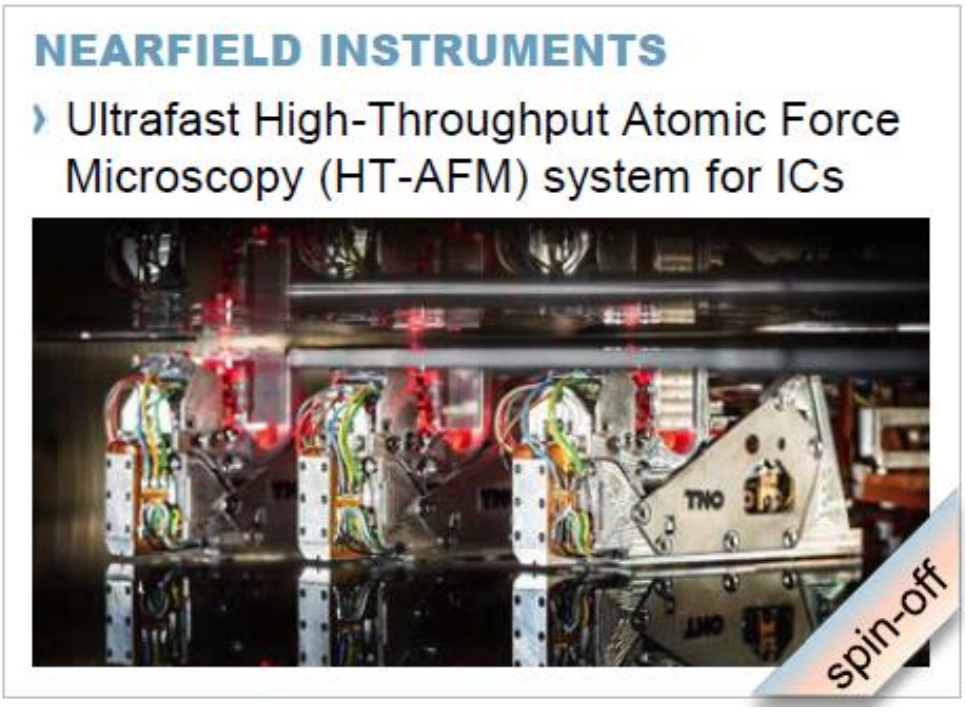
	Phase 1	Phase 2	Stopped	Spin-off	License	Total
Energy	1	1	1			**3**
Industry	4	7		2	2	**15**
Healthy Living	3			1		**4**
DSS				1		**1**
Urbanisation	1	2		1		**4**
Total	**9**	**10**	**1**	**5**	**2**	**27**

There are differences between the results of the different units, with "Industry" outperforming the other clusters. This reflect however the size of the Industry unit, the prior experience it obtained in this context, and policy concerning for example IPR. In practice it seems that a strong IPR position with relatively many patents is a good basis for involving external financiers, and subsequently trigger the establishment of spin-offs.

a. Successful case: Nearfield Instruments

Nearfield Instruments is an example of a successful spin-out that emerged out of the Technology Transfer Program. Nearfield Instruments was launched in 2016 with the aim to develop high-throughput atomic force microscopes for the semiconductor market.

Nearfield is a deep-tech start-up, that needed a substantial investment in an early stage of its lifecycle, without there being a product that would be ready for the market within a few years' time. Samsung Venture Investment Corporation indicated its interest to invest, but insisted on the involvement of a local financier that would actively support Nearfield Instruments. The Tech Transfer team involved Innovation Industries, a Dutch investment fund for high-tech innovations in the Netherlands that is co-founded by TNO, and in which TNO has a small share. Samsung Venture Investment Corporation and Innovation Industries now have invested 10 million Euros in Nearfield Instruments.



b. Successful case: Tiledmedia

Tiledmedia is an example of a successful spin-out that emerged out of the Technology Transfer Program in 2017. From the company website: "Tiledmedia is a global frontrunner in flexible and affordable, low-latency delivery of extremely high-resolution video content to consumer devices. Through our advanced software products, distributors of high resolution content – e.g. 360-degree Virtual Reality video or 180-degrees panoramic video – can reach the maximum number of viewers with the highest available quality. Our product portfolio enables advanced streaming features like directional streaming and zooming without resolution loss."[12] Tiledmedia has established collaboration with relevant stakeholders in its, such as Sky and Ericsson.

Tiledmedia received about 1M€ in seed capital from a group of angel investors at the end of 2017. Some of these investors got involved at a dedicated pitch-event, where 3 initiatives from the programme presented their business case. This event was organised by the Tech Transfer team, in collaboration with a Dutch bank, with about 20 informal investors. Other financiers came from within the informal network of investors from TNO. In March 2018, InnovationQuarter joined the group of investors. The Tech Transfer team initiated and facilitated contacts with InnovationQuarter.

Informal investors play an important role in the early stage financing of start-ups. Many of these informal investors are not linked to formal / institutionalised formalised structures or networks. TNO therefore has established contacts with the above-mentioned bank in the Netherlands to get access to their network of clients that have expressed interest in investing (/ acting as an informal investor. This also provided an access to insight concerning their potential / capital they might be willing to invest / had invested previously. Linking to this

[12] See www.tiledmedia.com.

network acts as a 'filter'. As such no time is wasted in identifying appropriate investors. The bank supported / advised these investors, with general guidelines on how to invest: do's, don't' s, etc. Bank provided almost something like schooling of these informal investors, as well as support from some seasoned expert.

c. Lessons learned

The abovementioned cases, as well as other examples resulting from the implementation of the Technology Transfer Program, have resulted in a series of lessons learned, that have been adopted in the approach towards supporting especially spin-offs:

- The spin-off teams are exposed to 'the outside world' already at a very early stage of their life-cycle, even before they are 'investment ready'. This implies that the spin-off get in contact with financiers for 'external evaluation' of their business plan, for example during dedicated 'pitch-events'. This contributes to the further shaping of their plan. The Technology Transfer team has a pool of investors that are willing to contribute to this process.
- The Technology Transfer team has increased involvement of the specific ecosystem of a spin-off, as to obtain competences which are lacking in the spin-off.
- The Technology Transfer Program has been extended from set-up to first financing round, as to increase the probability of success. Especially the financing of the very early stages is complex, with external support from other sources lacking.

3. Interactions with broader national context

An instrument used to support spin-offs resulting from TNO's Technology Transfer Program is the Take-off program from the Netherlands Organisation for Scientific Research (NWO). NWO is involved, amongst others, in policy delivery of instruments originating from the Dutch Ministry of Education, Culture and Science (OCW).[13] The Take-off program "supports economic activity and entrepreneurship resulting from the Dutch public research infrastructure". The program aims at addressing "the 'funding gap' between research and market", and explicitly mentions the financing of initiatives "that build on knowledge resulting from [Dutch] RTOs [including TNO]".

Take-off offers two modalities of financing: i) a grant of €20.000 - €40.000 for a feasibility study (called phase 1 financing, for a maximum duration of 6 months); ii) a loan of €50.000 - €2500.000 to finance the activities required to bring a knowledge based innovation to the market (called phase 2 financing, for a maximum duration of 24 months). Phase 2 includes market research, design and testing of the production process, set-up of the marketing and finance plan. It provides the basis to get ready for the further financing stages.

Another instrument used to support TNO spin-offs is the Innovatiekrediet, from the Netherlands Enterprise Agency (RVO), RVO is involved in policy delivery of instruments originating from the Dutch Ministry of Economic Affairs and Climate (EZK).[14] The Innovatiekrediet offers firms (small, large, established or start-up) a loan that allows them "to develop promising and challenging innovations with market potential" that have the potential to enter the market within 5 years. The instrument provides access to financing "when turnover is not yet created, and external investors are not willing to participate." The total costs for further development should succeed €150.000. The maximum size of the loan equals €5 - €10 million, depending on the characteristics of the innovation.

There are additional instruments available that support "ambitious entrepreneurs and start-ups", that are part of the 'Action Plan Ambitious Entrepreneurship':[15]

- The abovementioned Take-off program is part of the program called 'Early-phase-financing' (Vroegefasefinanciering (VFF)). The VFF offers similar support, but also to SMEs and innovative starters with less than 5 years.
- 'StartupDelta' is "an independent public-private partnership [that aims at eliminating] obstacles for all startups while accelerating and connecting the startup ecosystem." It provides "specific actions right where it is needed; for the ecosystem, with the ecosystem: one single hub, access to capital, access to networks, access to markets, access to tech talent & skills, access to knowledge & technology.". In practice it acts as a platform providing advice on the abovementioned services. Furthermore, it supports Dutch start-ups in accessing foreign markets, and tries to attract foreign start-ups.[16] This is supported by a

[13] See www.nwo.nl/onderzoek-en-resultaten/programmas/take-off. The program is run together with The Netherlands Organisation for Health Research and Development (ZonMw), another entity involved in policy delivery of instruments resulting from OCW, but focussing on the health sector.

[14] See www.rvo.nl/subsidies-regelingen/innovatiekrediet.

[15] See www.rijksoverheid.nl/onderwerpen/ondernemen-en-innovatie/ondersteuning-aan-ambitieuze-ondernemers-en-startups.

[16] See www.startupdelta.org.

dedicated public measure providing a temporary residence permit to foreign entrepreneurs.

- 'Knowledge platform NLevator' / 'nlgroei', a platform implemented as a public-private partnership of entities that support firms that have a turnover of €1 million with the intention to grow further, by means of a mentoring program.
- 'Seed Capital' is a fund from the Dutch government with private financiers that supports closed-end venture capital funds that invests in potentially successful high-tech and creative start-ups.
- There is a similar program for smaller investors called the 'Seed Business Angel' program, that offers €1 million for angel partnerships of two investors that are willing to finance high-tech and creative start-ups.

Based on TNO's experience with the policy framework governing and supporting spin-off creation in the Netherlands, we have drafted the following recommendation for further optimisation of the mix of instruments and regulations:

- The instruments of the Dutch policy addressing start-ups offers financial support primarily in the form of a loan, and not so much direct support (i.e. in the form of subsidies). Reason is that it is believed that this is the most straightforward and efficient modality of intervention. A loan however has some drawbacks, such as the fact that it is often provided at the very early stages of the set-up of the spin-off, and subsequently remains on the balance sheet at the stage of the development when additional external financing is required. This limits however the willingness of investors to finance a spin-off. Subsidies or even public participation (as a form of equity financing) in spin-offs could increase the effectiveness of financial support.
- Spin-offs and spin-outs that result from RTOs or universities build on knowledge that can (almost always) be traced back to publicly funded research. This implies that the transfer of the ownership of this knowledge is governed by the State Aid rules. The process to assess compliance with the rules is complex, extensive in time, and not all actors are aware of all regulations. The process should be simplified, and a common understanding of the regulatory framework should be established.
- Public support for spin-offs, as suggested above, is fragmented. Efficiency of policy delivery would increase, and subsidiarity issues would be addressed if policy instruments (also originating from regional policy) would be combined in a single programme.