

NanoNextNL

Netherlands micro/nanotechnology research and innovation programme

Conclusions by IAC of End Term
Review (ETR) of NanoNextNL



nanonextnl
innovating with micro and nanotechnology

Conclusions by IAC of End Term Review (ETR) of NanoNextNL 17-19 April 2016

Executive Summary

NanoNextNL has now grown into a nano-enabled networked ecosystem with scientific, innovation and business impact up to international benchmarks, with professional valorisation- and entrepreneurship guidance and education and with 'innovation safe by design' gradually -turning into a standard. People form the root of NanoNextNL. They take great pride in being a participant in the NanoNextNL activities and show extraordinary tech and business talent. Industries big and small have gained extra traction as a result of their participation in NanoNextNL. Some 80 SMEs have participated and are positive about the extra boost obtained from extra funding and the access to a network of top-talents in their tech orientation. Top science was executed with citation scores well above international benchmarks. Application orientation has grown naturally out of often basic research activities and has led to a number of new businesses amongst others through valorisation- and entrepreneurship guidance and training, as well as through targeted business development funding. Risk and Technology Assessment (RATA) started off as a need by specific request on NanoNextNL by the Dutch ministries. Now it is embedded in the business development models and in the 10 themes. 'Innovation safe by design' is gaining roots in the themes. The RATA approach draws international attention and is now influencing the European scene of tech enabled EU programmes.

Introduction

NanoNextNL is a Dutch national research and technology programme in which academic and industrial partners collaborate with the following mission:

"To accelerate the creation of durable economic and social value by developing and commercialising innovative nano- and microtechnology, and by forming a sustainable ecosystem of researchers, entrepreneurs and policy makers".

The programme comprises of 28 research programmes within 10 themes. The total NanoNextNL budget is € 251 million for the period 2010-2016 including matching funds from partners. Overall, some 750 PhD students, post-docs and other research staff at 13 universities, 8 medical centres, 12 knowledge institutes and 110 industrial partners contribute to NanoNextNL. Risk Analysis and Technology Assessment, RATA, is a core special theme introduced to stimulate and coordinate overarching risk research within NanoNextNL. This was at the special request of the Dutch ministries.

NanoNextNL is led by a 7 member Executive Board (EB) chaired by professor Dave Blank. The daily management committee consists of the chair and vice-chair of the board, the business director and the programme office director. The programme office comprises programme directorship, coordination, management, financial, legal and communication assistance (total 7.5 fte).

The EB works closely with a Supervisory Board of 18 stakeholders - 6 members related to knowledge institutes, 6 member linked to industry and 6 members linked to adjacent programmes - that oversees the general progress of the NanoNextNL programme and gives advice to the EB.

Each NanoNextNL programme is led by a Programme Director. Each theme is overseen by a Theme Coordinator. The International Advisory Council (IAC) comprises internationally renowned specialists in the micro and nanotechnology field and gives advice to the EB. This IAC carried out a mid-term review of the programme in 2013 and a final review in 2016.

This document summarises the findings of the IAC in its end-term review held in Utrecht, on 17-19 April 2016.

Approach

The input to the ETR has been a presentation of the EB to IAC on 17 April and the ETR (Self Evaluation) Report 2010-2016 edited by Floor Paauw of the programme office and Albert Polman of the EB. The report addresses Science, Innovation, RATA, Education and Added Value of the NanoNextNL approach. In a 94 page Research Appendix the individual results of the 10 themes are described as well as the Key Performance Indicators, partners, budgets and publications in high impact journals.

The actual review has been done by 43 interviews on 18 April. Programme owners, business (development) owners as well as PhD students and postdocs were interviewed. In a special session attention was given to the role of the Public-Private Partnerships. On 19 April ideas on selective continuation were shared by the EB with the IAC. Around noon the results of the evaluation by the IAC were presented to the EB in power point format.

The IAC reviewers comprised of Gilbert Declerck, Pingfan Rao, Karel van der Mast and Martin Schuurmans, chair. In all interviews, the IAC acknowledges the great support and help of Floor Paauw, Margot Beukers, Léon Gielgens and their staff.

The IAC has focused very much on what goes well, on the changes in comparison to the mid-term review (MTR) and what can be done even better i.e. what improvements can be suggested. We like to acknowledge that all those interviewed have been going out of their way in accommodating questions and discussions. All in all the review was seen by us and by the interviewees as a very stimulating and learning event. The IAC has sent a thank-you note to all participants.

Accomplishments!

- *People:* the interviews with the PhDs and postdocs made clear that NanoNextNL has been able to attract top of the bill people for its activities. Enthusiast, bright, responsive and outgoing. This goes a long way to explaining the success of NanoNextNL. In general the quality of people, in particular the scientists and engineers, is high level, and consistent with international benchmarking! The drive towards high scientific goals is commendable and has paid off as, for example, the research in the Energy theme demonstrates with a citation impact score of more than 4 times the international average. It is also impressive to see PhDs and postdocs commercialise their own technology; the business development approach has played an important role here.
- *Science:* Most programmes contain science that can stand any international benchmark test. Some themes score well above international citation impact like RATA, Energy, Nanomedicine, Beyond Moore, Nanomaterials and Nanofabrication. In the interviews we were positively surprised by the great progress of the theme Food since the MTR. This theme is now clearly impactful with a fine mix of science and application and standing in good relation with societal relevance.
- *Ecosystem:* the build-up of an interdisciplinary, networked and sustainable ecosystem of researchers, entrepreneurs, SMEs and multinational industry is clearly visible and operative. Both big industry and SMEs testify positively to access to people and to competencies that in the absence of NanoNextNL would not have been possible. In the development of the ecosystem performance or absence thereof has played a positive role in the sense that over the years changes in partnerships did take place. Also the traditional borders of the nano-field were crossed for example when nanomedicine researchers got access to clinicians in hospitals.
- *Application focus:* Application focus has grown since the MTR. Examples are the upscaling of microfluidic emulsification to industrial scale in the Food theme and the work on graphene alginate for fuel cell applications in the Energy domain. What is especially positive is that curiosity driven research and application orientation go hand in hand and not in competition.
- *Multinational Industries:* Several industries reported work that would not have been done in the absence of the NanoNextNL programme. Examples are tumour pathway identification testing for ovarian cancer in Philips, EUV

contamination control for ASML and microscopy work for FEI. Typically these address high risk reward areas that normally would not have been tackled in a more near term focussed industry. All of them are potentially important for future business of these companies.

- *SMEs:* Several of them report significant contributions to the development of their company through added research and development coupled to broad access to technology in NanoNextNL and through funding. Examples: Tagworks Pharmaceuticals, Surfex, Chemtrix and LioniX. The companies also benefited from business development grants (obtained in competition) and valorisation and entrepreneurship training. Limited reporting burden was seen as a plus. Many tech SMEs see NanoNextNL as the only valorisation programme accessible to their type of industry.
- *Talent education:* NanoNextNL has broadened, deepened and fostered education amongst others through RATA and IP& Valorisation and Entrepreneurship courses. The interviewees that had taken a course were clear in their opinion: the courses are professional and highly valuable. The IAC shares this view. Entrepreneurship trained people saw the world of innovation in a completely different light. For some the course has led to the formation of their own company. For future technology enabled programmes IAC would recommend to start training all staff immediately after recruitment.
- *Valorisation:* In 2014, after the MTR, the NanoNextNL Valorisation Programme was initiated to identify, nurture and develop product and business ideas emerging from the science and technology in NanoNextNL. Lean Model Business Canvas and Golden Egg check were employed as tools. Business development grants were awarded after competition. This has supported existing companies (SMEs primarily) and has led to some 10 start-up companies. Patent filing (over budget) is 9 times higher than in the previous FP7 programmes; 85 patents were filed. In the NanoCity conference of 2015 several product demonstrators were reported.
- *New business creation:* Some 10 new businesses have been created out of research findings in NanoNextNL. Offset against a valorisation budget of approximately € 7 million this is a very commendable result. For the future the start-up companies may receive a bit more support towards a proper international go-to-market strategy.
- *RATA:* Since the MTR significant progress has been made in introducing RATA in the themes and in the business development process. RATA has been introduced in the Stage-Gate innovation approach of Cooper. RATA has also delivered on its training ambitions and with happy trainees as well! Today RATA research is providing input into the European research agendas on Nanosafety. More recently RATA partners have developed a 'Safe-by-Design' concept aimed at using safe materials and products through the entire design phase of research and development. Safe-by-Design may well prove its value in many technology enabled programmes. IAC encourages RATA and its partners in the remaining run period of NanoNextNL to build a set of practices from tech cases and business cases as examples to build on.

In summary, NanoNextNL has strengthened the high tech environment in the Netherlands meaning that cooperation between Public-Private and Academia-Academia has been strengthened, interdisciplinary ecosystems have been formed, excellent and goal oriented people deliver enthusiastic contributions to the programmes, talent education has been broadened (RATA, business) and deepened (focus in programmes), science and engineering are generally up to international benchmarks and economic and social value creation are tangible. In short NanoNextNL lives up to its mission.

Future Technology Enabled Innovation Programmes

From our interviews a couple of recommendations become clear for future tech enabled innovation programmes:

- The strengthening of the research, development and innovation of high tech SMEs should be maintained.
- Through NanoNextNL multinational companies have endeavoured in high risk research. Matching through in-kind contributions of the companies was essential. The contributions of multinational high tech companies are essential to a tech enabled programme.
- For future Public-Private Partnerships, PPP's, performance and funding should be coupled allowing non-performing projects to be stopped and new projects to be started.
- Intrapreneurship and entrepreneurship, guidance and education, are essential to the success of any tech enabled innovation programme.

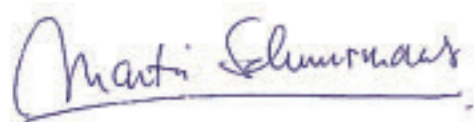
Beyond NanoNextNL

The NanoNextNL programme comes to an end on 31 December 2016. In our view it has been highly successful. The EB of NanoNextNL has invited views of the IAC on a selective continuation of the programme. Here is a brief summary of our thinking:

- We very much support a form of selective continuation of NanoNextNL and encourage the government to find ways to support a new form of a Tech Enabled Innovation Programme.
- It should consist of a number of networked PPP's and target areas of societal relevance (Energy, Health and Food, for example) through tech enabled innovation.
- We highly recommend that the above ingredients under Future Innovation Programmes be maintained as well as a programme of business development, valorisation, entrepreneurship and RATA shared by the PPP's (cost-effectiveness driven).

In summary: it has been our great pleasure and privilege to follow NanoNextNL in its path towards impactful innovation. We wish the people of NanoNextNL continued success in their endeavours.

20 April 2016, Martin Schuurmans,



Chair IAC, NanoNextNL, on behalf of the IAC

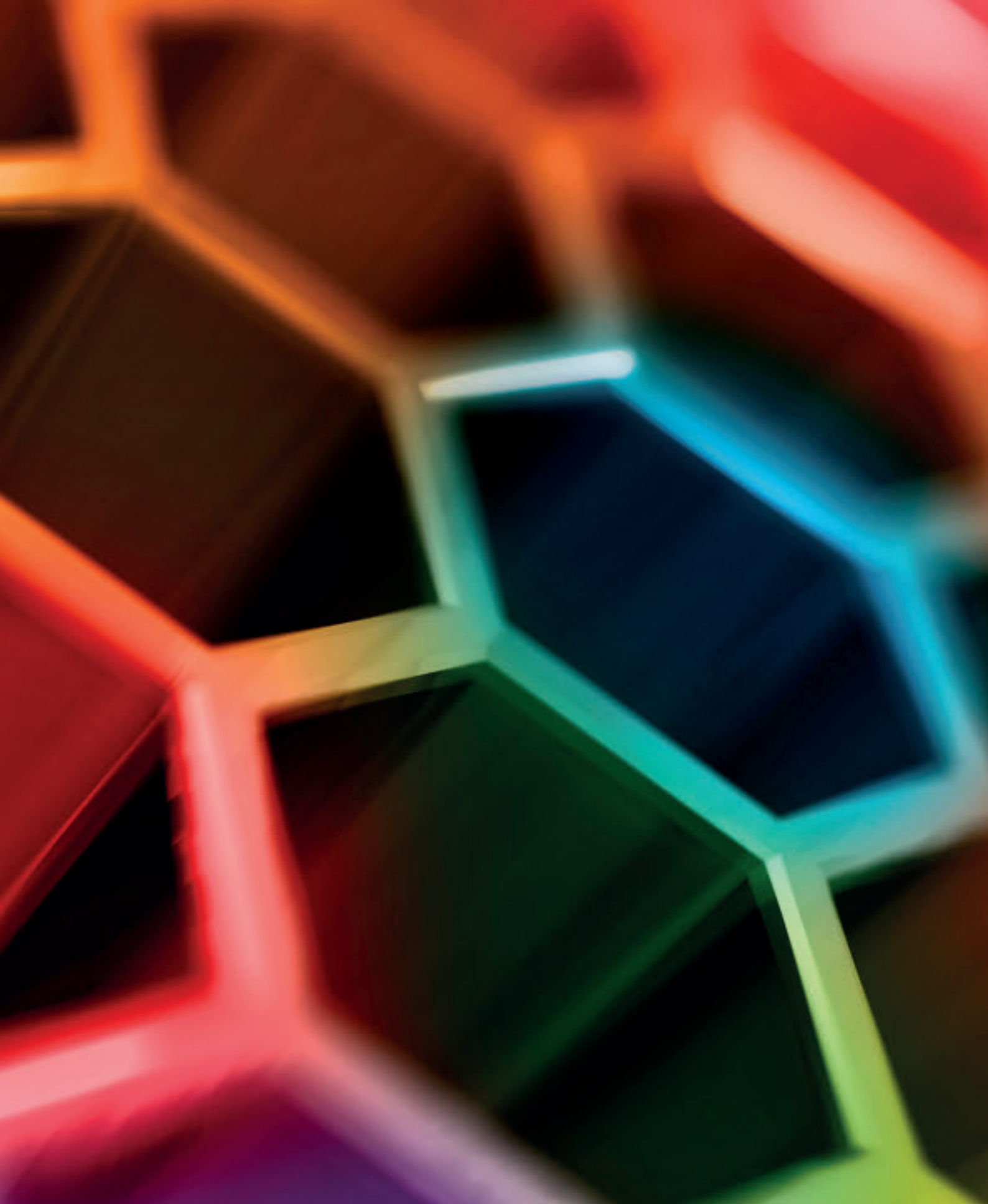
Members International Advisory Council NanoNextNL

The International Advisory Council of NanoNextNL consists of four internationally renowned micro- and nanotechnology experts:

- Prof. Martin Schuurmans, member of the Dutch Advisory council for science, technology and innovation (AWTI) and former Chair European Institute of Innovation and Technology
- Prof. Gilbert J. Declerck, Interuniversitair Micro-Elektronica Centrum (Imec), Belgium
- Dr. Karel van der Mast, Solveigh Corporate Development, the Netherlands
- Prof. Pingfan Rao, Fuzhou University, China



The International Advisory Council of NanoNextNL: (from left to right) Pingfan Rao, Karel van der Mast, Martin Schuurmans, Léon Gielgens (programme office), Gilbert J. Declerck, Margot Beukers (programme office)
Photo: Arnaud Mooij



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